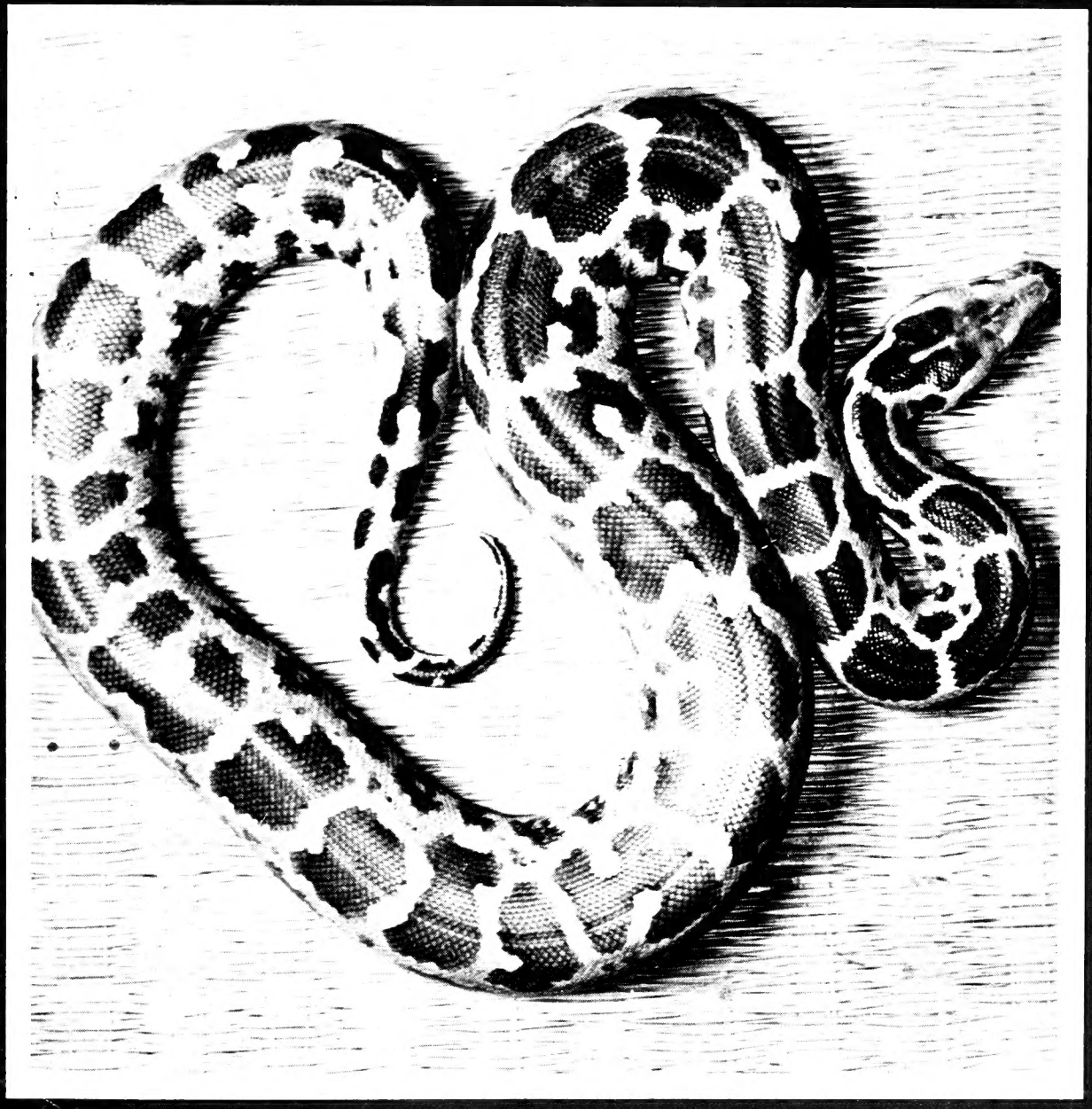
Significant Trade in Wildlife:

A Review of Selected Species in Cites Appendix II

Volume 2: Reptiles and Invertebrates



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SIGNIFICANT TRADE IN WILDLIFE:

A REVIEW OF SELECTED SPECIES IN CITES APPENDIX II

COMMERCE IMPORTANT DES ESPECES SAUVAGES: ENQUETE AU SUJET DE CERTAINES ESPECES INSCRITES A L'ANNEXE II DE LA CITES

COMMERCIO SIGNIFICATIVO DE VIDA SILVESTRE: ESTUDIO DE DETERMINADAS ESPECIES INCLUIDAS EN EL APPENDICE II DE CITES

VOLUME 2: REPTILES AND INVERTEBRATES

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The views of the authors expressed in this publication do not necessarily reflect those of IUCN or the CITES Secretariat.

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Brian Groombridge	*Geochelone chilensis*, *Testudo* spp., *Crocodylus* spp., *Varanus* spp., *Python* spp.,
Diana Evans	*Geochelone pardalis*, *Malacochersus tornieri*, *Phelsuma* spp., *Chamaeleo* spp.
Richard Luxmoore	*Podocnemis expansa*, *Caiman crocodilus*, *Iguana iguana*, *Dracaena guianensis*, *Tupinambis* spp., *Boa constrictor*, *Eunectes* spp.
Mark Collins	*Ornithoptera* spp.
Sue Wells	*Papustyla pulcherrima*, *Cirrhipathes anguina*.

Tim Inskipp was responsible for the over-all co-ordination of the contract and assisted with the literature research. John Caldwell produced the basic trade tabulations from the Wildlife Trade Monitoring Unit computerised database. Wendy Coombes and Andrew Desforges carried out much of the analysis of the CITES trade data. The accounts for *Geochelone chilensis*, *Malacochersus tornieri*, *Testudo graeca*, *Testudo hermanni*, *Podocnemis expansa*, *Caiman crocodilus*, *Crocodylus n. novaeguineae* and *Crocodylus porosus* were based on the accounts written for the IUCN Amphibia-Reptilia Red Data Book, Part 1, Testudines, Crocodylia, Rhynchocephalia.

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INTRODUCTION

Background

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was drawn up in 1973 to control trade in wildlife. It does so by affording to species either of primarily two levels of protection. Those species (or smaller geographical populations) which are threatened with extinction are listed in Appendix I, and are thereby banned from international commerce under most circumstances. Species which are not currently threatened with extinction, but which may become so unless their trade is regulated, are listed in Appendix II. Such species may be traded internationally, but nations must ensure that the levels of trade do not endanger the remaining wild populations. This requirement is expressed formally in the text of the Convention in Article IV, paragraph 2a, which demands that the authorities in exporting countries must have advised that the export of specimens of such a species "will not be detrimental to the survival of that species". Article IV, paragraph 3 indicates that the trade in a species "should be limited in order to maintain the species throughout its range and at a level consistent with its role in the ecosystem in which it occurs and well above the level at which that species might become eligible for inclusion in Appendix I". The authorities in the exporting country must monitor the exports and take steps to limit them whenever they determine it to be necessary.

At the fourth meeting of the Conference of the Parties to CITES, held in 1983 in Gaborone, Botswana, it was recognised that many countries exporting Appendix II wildlife were unable, on their own, to determine whether the levels of trade were having a detrimental effect on the wild populations. Therefore it was recommended (CITES Resolution Conf. 4.7) that the CITES Technical Committee should provide assistance by identifying those Appendix II species which were currently being traded internationally in significant quantities, but for which there was insufficient scientific information on the capacity of the species to withstand such levels of trade to satisfy "the requirements of Article IV, paragraph 3, of the Convention as determined by the range states". It was recommended that once the species of particular concern had been identified, the Technical Committee, together with the range states involved, importing states and organisations experienced in the management of wildlife, "develop and negotiate measures required to ensure that continued trade in these species is within the terms of Article IV, paragraph 3".

Initial discussions of the means by which the Technical Committee could identify those species of particular concern (as recommended by Resolution Conf. 4.7) were based on the premise that a high volume of trade was sufficient evidence alone to justify concern. However, an unpublished report produced in 1984 by WTMU for the CITES Secretariat, on the perception of the issue of high trade-volume, came to the following conclusions:

- The concept of high trade-volume may be approached in two ways: high volume may be considered in absolute terms (i.e. large numbers), or in relative terms (i.e. large numbers in relation to the population and biology of the species).

- Absolute high trade-volume does not alone have any bearing on whether a species is threatened by trade. However, species traded in high absolute numbers are likely to be of considerable ecological significance.

- Relative high trade-volume is of direct relevance to the survival of the species involved, but there is no evidence that this is correlated with absolute high trade-volume. By virtue of their designation on the

Appendices, trade in all CITES-listed species is of concern, and should be monitored.

- Consideration of absolute high trade-volume as a major criterion for selecting species for special attention is thus not only irrelevant in terms of species conservation, but may divert attention from more important cases.

The Technical Committee Working Group on Significant Trade in Appendix II Species produced a paper, based on its meeting in Switzerland in December 1984, which aimed to formulate a procedure or course of action to enable the Technical Committee to fulfil the recommendations of Resolution Conf. 4.7. It was decided that the Group should restrict its attention to fauna, as a Plant Working Group was already in existence. The conclusions of the WTMU report on high trade-volume were endorsed, in that the Working Group agreed that it was not possible to identify those Appendix II taxa of greatest concern on the basis of trade data alone. Information on biological status, population trends and a whole range of other factors was needed in order to assess properly the impact of the trade in those taxa.

A five-part procedure was established as the most appropriate mechanism for implementing Resolution Conf. 4.7. This plan was presented to the fifth meeting of the Conference of the Parties which was held at Buenos Aires, Argentina in 1985 (Doc. 5.26). Steps 1-3 have already been carried out.

Step 1: Production of list "A"

It was acknowledged that, with a very few exceptions, all taxa listed in Appendix II should be able to withstand some degree of exploitation for international trade. The Working Group chose an arbitrary "safe" level of trade for any such taxon of an average of 100 individuals taken from the wild (globally) and entering trade per year. By eliminating all taxa traded at a level within that considered "safe", a list of "potential candidate" taxa could be produced (List "A"). These taxa were defined as those that might be the subject of significant international trade.

List A was prepared by WTMU on the basis of average trade volume over the period 1980-1982. Figures relating to live specimens (excluding those recorded as captive-bred), whole or substantially whole skins, skin flanks/sides, furskin plates, shells, trophies and other worked material were included in the analysis. Species never recorded in trade, with the exception of those included in Appendix II as part of a higher taxon or for look-alike reasons, were listed separately in order that consideration could be given to their deletion from the Appendices.

Step 2: Production of list "B"

The Working Group agreed that some taxa might be eliminated from consideration as "significant trade" species on the basis of knowledge readily available to the Group regarding their status. After this process, the remaining taxa constituted list "B", which contained those taxa which could be classified as a "possible problem". In addition, two species (*Tupinambis rufescens* and *Papustyla pulcherrima*) were added to this list under special circumstances where there was evidence of a problem despite only a low volume of trade being recorded.

Step 3: Production of list "C"

The next phase in the procedure was to assess the information available for each of the species in list "B", and to eliminate those species which

were, on the basis of expert knowledge, known not to be a problem. This part of the operation entailed the collection of information on as many aspects of each species as possible and the assessment of the impact of the known trade on the known population. The Working Group agreed that for each species the global situation should be of paramount importance, but that if a species were apparently being affected by trade on a national or regional scale, this fact should be noted in an addendum to the list. List "C" was to be divided into two groups: those species for which current information or knowledge of their biology and/or management indicated that the population was being detrimentally affected by international trade (List 1), and those species for which there is insufficient information available on which to base such a judgement (List 2).

Step 4: Development of remedial measures

The Technical Committee, or a working group of the Technical Committee, was to examine the lists "1" and "2" and establish priorities within each list. For species of high priority in list "1", workshops were to be convened to formulate recommendations for remedial measures. Such measures would include, but not necessarily be limited to: preparing proposals for transfer to Appendix I; establishment of additional management procedures both for wild populations (hunting quotas, seasons, size limits, etc.) and for trade controls (such as export quotas); and listing of taxa for look-alike reasons.

For species of high priority in list "2", projects were to be established to collect information on the biology and management of the species. Where such information indicated the need, the species were to be transferred to list "1".

Step 5: Implementation of remedial measures

The remedial measures identified were to be carried out by the range states involved on the basis of the recommendations arising from the workshops.

This five-step procedure was approved at the Buenos Aires meeting in 1985 and steps 1-3 were implemented by the IUCN Conservation Monitoring Centre. List "C" was prepared in time for the second meeting of the Technical Committee, held in June 1986 in Lausanne, Switzerland. For each species in list "C", a draft report was prepared presenting a summary of all available information, including a detailed analysis of available trade data and information on the population status and other factors thought to be of relevance. On the basis of this information, each species was assigned to the two recommended lists (list 1, problem species; list 2, possible problems). At this stage it was also discovered that some species, originally included in list "C", were probably not being significantly affected by the current levels of trade. These were assigned to a third group (list 3, no problem). The Significant Trade Working Group reviewed the information provided by CMC and the suggested listings, and made a number of recommendations for further action which are outlined below. The Technical Committee also decided that, after further review, the report prepared by CMC should be published.

Further action

The Significant Trade Working Group presented a paper at the second Technical Committee meeting outlining proposals for further action (WGR.TEC. 2.2). The recommendations of this report, some of which were amended at the Technical Committee meeting, are detailed below for the reptile species involved.

List 1 (4 taxa)

Podocnemis expansa The international trade data are probably greatly exaggerated as a result of false identification. The Secretariat should notify the Parties of current trade bans, and Venezuela will consider developing a proposal to transfer the species to Appendix I bearing in mind the possible insignificance of international trade.

Caiman crocodilus The problem is being addressed by the Secretariat's project in Bolivia, Brazil and Paraguay and the results of this study should be useful in the establishment of appropriate quotas. Funding for the second project (Brazil, Colombia and Venezuela) is needed. Studies of the population status in Central America should be considered. Historical trade data including numbers and sizes of skins should be collected and analysed. Where the species is legally exploited, national harvest quotas should be established.

Geochelone chilensis Management action already taken by Argentina is considered adequate.

Tupinambis spp. Steps are being taken by Argentina to review their harvest quotas. Illegal trade may continue to be a problem and the Secretariat should assess the 1984/85 trade statistics, identify any importing countries permitting trade from exporting countries with export bans and request that the necessary action be taken to halt this problem. The Nomenclature Committee should clarify the taxonomy.

List 2 (17 taxa)

The Working Group recommended that the following taxa should receive attention as priority species or groups of species for the collection of information (in order of importance):

1. Asian Varanidae (three species, i.e. *Varanus salvator* and the Appendix I species *V. bengalensis* and *V. flavescens*).

2. Asian pythons (three species, i.e. *Python curtus*, *P. molurus bivittatus* and *P. reticulatus*).

3. African monitor lizards (two species, i.e. *Varanus exanthematicus* and *V. niloticus*) - noting that the project should concentrate on aspects necessary to assess the levels of exploitation that the species can sustain.

4. South American Boidae (three species, i.e. *Boa constrictor*, *Eunectes murinus* and *E. notaeus*).

5. *Papustyla pulcherrima*.

In addition the Group made the following special recommendations:

Dracaena guianensis The Parties having populations of *Dracaena* spp. should clarify the situation with respect to distribution and consider listing *Dracaena* spp. in Appendix II.

Crocodylus porosus The IUCN/SSC Crocodile Specialist Group should be asked urgently to review the management programme for this species in the light of the recent Indonesian report.

List 3 (15 taxa)

It was agreed that available information indicated that these taxa were essentially unaffected by international trade.

METHODS

This report comprises the review of the biological and trade status of species included in list "C". It was carried out by the IUCN Conservation Monitoring Centre under contract to the CITES Secretariat over the period September 1985 to April 1986. As a first step, the CITES Secretariat circulated a request for information to all of the countries in which the species occurred, contacting the CITES Management Authorities in the countries party to CITES and designated wildlife management or equivalent authorities in others. The responses to this request were passed to CMC and are referenced in the following format: Name of country CITES MA, 1987. Comments received from wildlife management authorities in non-Party states are referenced by the name of the government department involved. Information was also solicited from relevant specialists (individuals or agencies), and amongst the major sources were the specialist groups of the IUCN Species Survival Commission. Trade organisations and other interested parties were also approached. A draft report was presented to the 2nd meeting of the CITES Technical Committee in June 1986. This report was discussed and amended by the Committee and review copies were again circulated by the CITES Secretariat to all range states and interested parties, including the Pet Industry Joint Advisory Council. Final modifications to the text and recent trade data were added by CMC during 1987.

In a small number of cases the designation of category of a species at the time of the second Technical Committee meeting has subsequently been amended in the light of new information, in particular the 1985 trade data which have been added to the reports.

Information was collected and collated under the following headings: distribution; population; habitat and ecology; threats to survival; international trade; conservation measures; and captive breeding.

CITES trade data were analysed for the years 1980 to 1985 using the Annual Reports of Parties to the Convention for which the statistics are held on computer at CMC. These data contain records of imports and exports of species listed in the CITES Appendices and of their products. They contain information on the species involved, a description of the type and quantity of product and, in the case of imports, the exporter or re-exporter and primary source country, and, for exports, the destination and original source. For trade between two CITES Parties, each transaction should therefore be reported twice, once by the importer and once by the exporter. As suggested by the Significant Trade Working Group, the analysis was largely restricted to trade in live animals and unworked products, however, in a small number of exceptional cases worked products were included.

Various problems impair the value of CITES trade data in the assessment of levels of world trade. For example: not all trading nations are CITES Parties; not all CITES Parties produce annual reports; and the reports of those that do, vary in quality and regularity of submission. Some countries may report the number of specimens covered by the permits issued, while others report the actual number for which the permit was used. Furthermore exports from a country at the end of one year may arrive in the importing country early in the next and in such cases it is possible that the same transaction may be recorded in the trade tables for both years. These factors and others have to be taken into account when analysing CITES data, but for most species

these statistics are the only detailed source of information on their international trade and generally CITES reports are of great value in assessing approximate levels of legal trade, the geographical patterns in such trade and the trends in volume and commodity preference over time.

In most cases the trade data are presented, in the following accounts, in two tables. The first (usually Table 1) details the net imports of importing countries, the total of which gives an estimate of the minimum volume of world trade for each year. The second (usually Table 2) shows the origin, or where no origin was given, the exporter, of specimens in trade. When specimens have been exported to an intermediate country and subsequently re-exported, the minimum net trade was calculated, ensuring that the numbers were only recorded once. The table therefore shows, for each year, the minimum number of items in trade from each country of origin. However, because some items may be re-exported without the country of origin being specified, they may be recorded twice in Table 2. The totals are therefore usually higher than those in Table 1.

INTRODUCTION

Informations générales

La Convention sur le commerce international des espèces de faune et de flore sauvages menacées d'extinction (CITES) a été élaborée, en 1973, pour contrôler le commerce des espèces de faune et de flore sauvages. Elle agit en offrant à ces espèces deux niveaux principaux de protection. Les espèces (ou de plus petites populations géographiquement isolées) qui sont menacées d'extinction sont inscritent à l'Annexe I, ce qui signifie que leur commerce international est interdit dans la plupart des cas. Les espèces qui ne sont pas actuellement menacées d'extinction, mais qui pourraient le devenir si leur commerce n'était pas réglementé, sont inscritent à l'Annexe II. Le commerce international de ces dernières espèces est autorisé, à condition que les pays s'assurent que le volume du commerce ne mette pas en danger la survie des populations sauvages restantes. Cette exigence est formellement énoncée à l'Article IV, paragraphe 2 a, du texte de la Convention, qui prévoit que les autorités des pays d'exportation émettent l'avis que l'exportation de spécimens de ces espèces "ne nuit pas à la survie de l'espèce intéressée". Le paragraphe 3 de l'Article IV indique que le commerce d'une espèce "devrait être limité pour la conserver dans toute son aire de distribution, à un niveau qui soit à la fois conforme à son rôle dans les écosystèmes où elle est présente, et nettement supérieur à celui qui entraînerait l'inscription de cette espèce à l'Annexe I". Les autorités des pays d'exportation doivent surveiller les exportations de façon continue et prendre les mesures qui s'imposent pour les limiter lorsqu'elles le jugent nécessaire.

Lors de la quatrième session de la Conférence des Parties à la CITES, tenue en 1983 à Gaborone, Botswana, il fut reconnu que maints pays exportateurs d'espèces de faune et de flore sauvages figurant à l'Annexe II étaient dans l'incapacité de déterminer par eux-mêmes si les niveaux de commerce avaient un effet nuisible sur les populations sauvages. C'est pourquoi, il fut recommandé (résolution CITES Conf. 4.7) que le Comité technique de la CITES assiste ces pays en identifiant les espèces de l'Annexe II faisant actuellement l'objet d'un commerce international important, mais pour lesquelles, selon l'avis des Etats de l'aire de répartition, les données scientifiques portant sur leur capacité à supporter le commerce à un tel niveau sont insuffisantes au regard des exigences de l'Article IV, paragraphe 3, de la Convention. Il fut recommandé que, une fois les espèces présentant un intérêt particulier identifiées, le Comité technique, en collaboration avec les Etats de l'aire de répartition intéressés, les Etats importateurs et les organisations ayant une expérience en gestion de la faune et de la flore sauvages, "mette au point et négocie les mesures nécessaires pour assurer le maintien du commerce continu de ces espèces dans les limites prévues à l'Article IV, paragraphe 3, de la Convention".

Les discussions initiales sur les moyens à utiliser par le Comité technique pour identifier les espèces représentant un intérêt particulier (selon la recommandation de la résolution Conf. 4.7) ont été fondées sur le principe qu'un volume de commerce important est, à lui seul, une indication suffisante pour justifier un intérêt. Toutefois, un rapport non publié, produit en 1984 par le WIMU pour le Secrétariat CITES et traitant de la manière dont il percevait la question du volume important du commerce, parvenait aux conclusions suivantes:

- Le concept du volume important du commerce peut être abordé de deux manières: un important volume peut être considéré en terme absolu (soit de grandes quantités) ou en terme relatif (soit de grandes quantités par rapport à la population et à la biologie de l'espèce).

- Un important volume de commerce, au sens absolu du terme, n'a pas en soi de rapport avec le fait qu'une espèce soit menacée ou non par le commerce. Toutefois, il est probable que les espèces dont de grandes quantités de spécimens, en terme absolu, sont commercialisés aient une importance écologique considérable.

- Un important volume de commerce, au sens relatif du terme, a un rapport direct avec la survie de l'espèce en question, mais rien ne prouve qu'il y ait corrélation avec un important volume de commerce au sens absolu du terme. Le seul fait que ces espèces soient inscrites aux annexes à la CITES signifie que leur commerce est motif à préoccupation et qu'il devrait faire l'objet d'une surveillance continue.

- Considérer un important volume de commerce au sens absolu du terme comme critère majeur de sélection des espèces nécessitant une attention particulière est donc non seulement hors de propos en ce qui concerne la conservation des espèces mais, qui plus est, risquerait de distraire l'attention de cas plus importants.

Le Groupe de travail du Comité technique sur le commerce important d'espèces de l'Annexe II a élaboré un document, fondé sur sa session tenue en Suisse en décembre 1984, session dont l'objectif était de formuler une procédure ou une ligne de conduite permettant au Comité technique de remplir ses obligations au titre des recommandations de la résolution Conf. 4.7. Il fut décidé que le groupe devait limiter ses discussions à la faune en raison de l'existence d'un Groupe de travail sur les plantes. Les conclusions du rapport du WTMU sur le volume important du commerce furent endossées, en ce sens que le groupe de travail convint qu'il n'était pas possible d'identifier les taxons les plus préoccupants de l'Annexe II sur la base des seules données commerciales. Des informations sur l'état biologique des taxons, sur les tendances de leurs populations et sur toute une série d'autres facteurs sont nécessaires pour évaluer correctement l'effet du commerce sur ces taxons.

Une procédure en cinq étapes, constituant le mécanisme le plus favorable pour l'application de la résolution Conf. 4.7, fut établie. Ce plan d'action fut présenté à la cinquième session de la Conférence des Parties qui eut lieu à Buenos Aires, Argentine, en 1985 (document Doc. 5.26). Les étapes 1 à 3 ont déjà été réalisées.

1ère étape: Production de la liste "A"

Il fut reconnu que, à très peu d'exceptions près, on peut raisonnablement assumer que tous les taxons inscrits à l'Annexe II peuvent supporter un certain niveau d'exploitation pour le commerce international. Le groupe de travail choisit un niveau de commerce arbitraire et "sûr" pour tout taxon, soit en moyenne 100 individus prélevés dans la nature (globalement) et entrant dans le commerce chaque année. En éliminant tous les taxons dont le commerce était considéré d'un niveau "sûr", une liste de taxons "candidats potentiels" (liste "A") put alors être établie. Ces taxons sont définis comme étant ceux qui *peuvent* faire l'objet d'un commerce international important.

La liste A a été établie par le WTMU sur la base d'un volume de commerce moyen couvrant la période 1980-1982. Les chiffres ayant trait aux spécimens vivants (sauf les spécimens enregistrés en tant qu'élevés en captivité), aux peaux entières ou substantiellement entières, aux flancs, aux nappes de peaux, aux carapaces, aux trophées et à d'autres articles travaillés ont été inclus dans cette analyse. Les espèces qui n'ont jamais été enregistrées dans le commerce, à l'exception de celles inscrites à l'Annexe II en tant que partie d'un taxon supérieur ou pour des raisons de

ressemblance, ont été énumérées séparément en vue de leur éventuelle élimination des annexes.

2e étape: Production de la liste "B"

Le groupe de travail convint que, sur la base des connaissances dont le groupe pouvait disposer aisément au sujet de leur état, certains taxons ne devaient plus être considérés comme des espèces faisant l'objet d'un "commerce important". Après cette opération, les taxons restants ont constitués la liste "B", laquelle contient les taxons qui pourraient être classés en tant que "problème possible". En outre, deux espèces (*Tupinambis rufescens* et *Papustyla pulcherrima*) ont été ajoutées à la liste dans des circonstances particulières: la mise en évidence d'un problème en dépit de l'enregistrement d'un faible volume de commerce.

3e étape: Production de la liste "C"

L'étape suivante de la procédure revenait à évaluer les informations disponibles pour chacune des espèces de la liste "B" et à éliminer les espèces qui, sur la base des connaissances des experts, ne posent pas de problème. Cette partie de l'opération fut réalisée en rassemblant des informations sur autant d'aspects que possible relatifs à chaque espèce et en évaluant l'effet du commerce connu sur la population connue. Le groupe de travail convint que, pour chaque espèce, la situation globale devait avoir une importance primordiale, mais que, si une espèce était apparemment affectée par le commerce à l'échelle nationale ou régionale, ce fait devait figurer dans un supplément à la liste. Les espèces de la liste "C" devaient être réparties en deux groupes: d'une part les espèces pour lesquelles les informations courantes ou la connaissance de leur biologie et/ou de leur gestion montrent que la population est affectée par le commerce international (liste 1) et d'autre part les espèces pour lesquelles les informations disponibles sont insuffisantes pour servir de base à un tel jugement (liste 2).

4e étape: Mise au point de mesures correctives

Le Comité technique, ou un groupe de travail du Comité technique, devait examiner les listes "1" et "2" annotées et établir des priorités au sein de chaque liste. Pour les espèces de la liste "1" ayant un ordre de priorité élevé, des sessions de travail devaient être convoquées dans le but de recommander des mesures correctives. De telles mesures devaient comprendre, sans nécessairement s'y limiter: la préparation de propositions de transferts de taxons à l'Annexe I; la mise en place de procédures de gestion supplémentaires, aussi bien en faveur des populations sauvages (telles que quotas de chasse, saisons de chasse, tailles limites des spécimens, etc.) qu'en ce qui concerne les contrôles du commerce (telles que quotas à l'exportation), et l'inscription de taxons pour des raisons de ressemblance.

Pour les espèces de la liste "2" ayant un ordre de priorité élevé, des projets devaient être élaborés afin de collecter des informations sur leur biologie et leur gestion. Lorsque ces informations en montraient la nécessité, l'espèce devait être transférée à la liste "1".

5e étape: Mise en vigueur des mesures correctives

Les mesures de correction identifiées devaient être prise par les Etats de l'aire de répartition intéressés, sur la base des recommandations formulées lors des sessions de travail.

Cette procédure en cinq étapes a été approuvée à la session de Buenos Aires, en 1985, et les étapes 1 à 3 ont été réalisées par le Centre UICN de surveillance continue de la conservation de la nature (CMC). La Liste "C" a été élaborée pour la deuxième session du Comité technique, qui s'est tenue à Lausanne, Suisse, en juin 1986. Pour chaque espèce de la liste "C", un projet de rapport a été rédigé, lequel présentait un résumé de toutes les informations disponibles, dont une analyse détaillée des données sur le commerce et des informations sur l'état des populations et d'autres facteurs jugés pertinents. Sur la base de ces informations, chaque espèce a été assignée à l'une deux listes recommandées (liste 1, espèces à problèmes; liste 2, problèmes possibles). A ce stade, on a également découvert que certaines des espèces figurant à l'origine sur la liste "C" n'étaient probablement pas affectées de manière significative par les niveaux actuels de commerce. Celles-ci furent assignées à un troisième groupe (liste 3, sans problème). Le Groupe de travail sur le commerce important d'espèces de l'Annexe II a étudié les informations fournies par le CMC, ainsi que les listes proposées, et a fait un certain nombre de recommandations quant aux activités futures qui sont décrites ci-après. Le Comité technique a également décidé que, après un nouvel examen, le rapport élaboré par le CMC devait être publié.

Activités futures

Le Groupe de travail sur le commerce important d'espèces de l'Annexe II a présenté un document à la deuxième session du Comité technique, document qui ébauchait des projets d'activités futures (WGR. TEC. 2.2). Les recommandations de ce rapport, dont certaines ont été modifiées lors de la session du Comité technique, sont présentées ci-dessous de façon détaillée en ce qui concerne les reptiles.

Liste 1 (4 taxons)

Podocnemis expansa - Les données sur son commerce international sont certainement grandement exagérées, en raison d'une identification erronée. Le Secrétariat devrait informer les Parties des interdictions actuellement imposées au commerce de cette espèce, et le Venezuela envisagera l'élaboration d'une proposition de transfert de l'espèce à l'Annexe I, en ne perdant pas de vue le fait que son commerce international pourrait être insignifiant.

Caiman crocodilus - Le problème est adressé par le projet du Secrétariat réalisé en Bolivie, au Brésil et au Paraguay et les résultats de cette étude devraient être utiles à l'établissement de quotas adéquats. Le financement du deuxième projet (Brésil, Colombie et Venezuela) doit encore être trouvé. Des études sur l'état des populations en Amérique centrale devraient être envisagées. Des données historiques sur le commerce de cette espèce, notamment sur les quantités de peaux et leur taille, devraient être réunies et analysées. Lorsque l'espèce fait l'objet d'une exploitation légale, des quotas nationaux devraient être établis.

Geochelone chilensis - La gestion de cette espèce déjà entreprise par l'Argentine paraît adéquate.

Tupinambis spp. - L'Argentine entreprend les démarches nécessaires à la révision des quotas de prélèvement de cette espèce. Il se pourrait que le commerce illégal de ces espèces soit toujours un problème et le Secrétariat devrait évaluer les statistiques commerciales de 1984-85, identifier tous les pays d'importation qui permettent le commerce avec des pays d'exportation ayant des interdictions d'exporter et demander que les mesures nécessaires soient prises pour mettre un terme à ce problème. La taxonomie devrait être clarifiée par le Comité de la nomenclature.

Liste 2 (17 taxons)

Le groupe de travail a recommandé que les taxons suivants reçoivent une attention particulière en tant qu'espèces ou groupes d'espèces hautement prioritaires en ce qui concerne la collecte d'informations à leur sujet (par ordre d'importance):

1. Varanidae asiatiques (trois espèces, soit *Varanus salvator* et les espèces *V. bengalensis* et *V. flavescens* inscrites à l'Annexe I).

2. Pythons asiatiques (trois espèces, soit *Python curtus*, *P. molurus bivittatus* et *P. reticulatus*).

3. Varans d'Afrique (deux espèces, soit *Varanus exanthematicus* et *V. niloticus*) - à noter que le projet devrait se concentrer sur les aspects nécessaires à l'évaluation des niveaux d'exploitation que l'espèce peut supporter.

4. Boidae sud-américains (trois espèces, soit *Boa constrictor*, *Eunectes murinus* et *E. notaeus*).

5. *Papustyla pulcherrima*.

En outre, le groupe a fait les recommandations spéciales suivantes:

Dracaena guianensis - Les Parties ayant des populations de *Dracaena* spp. devraient clarifier la situation en ce qui concerne leur répartition et envisager l'inscription de *Dracaena* spp. à l'Annexe II.

Crocodylus porosus - Il serait urgent de demander au Groupe de spécialistes des crocodiles de la Commission de sauvegarde des espèces de l'UICN de réviser le programme de gestion de ces espèces à la lumière du récent rapport indonésien.

Liste 3 (15 taxons)

Il a été convenu que les informations disponibles indiquent que ces taxons ne sont pas au premier chef affectés par le commerce international.

METHODES

Ce rapport comprend l'examen de l'état biologique des espèces contenues dans la liste "C" et des données commerciales les concernant. Il a été élaboré par le Centre UICN de surveillance continue de la conservation de la nature, sur la base d'un contrat avec le Secrétariat CITES, au cours de la période septembre 1985 - avril 1986. Dans un premier temps, le Secrétariat CITES a adressé, par l'intermédiaire des organes de gestion CITES des pays Parties à la Convention ou des autorités responsables de la gestion de la faune ou équivalentes des pays non-Parties, une demande d'informations à tous les pays dans lesquels se rencontrent les espèces de la liste "C". Les réponses reçues ont été envoyées au CMC et il y est fait référence en indiquant le nom de l'organe de gestion de la Partie CITES en 1987. Il est fait référence aux commentaires reçus des autorités responsables de la gestion de la faune dans les pays non-Parties en indiquant le nom du département gouvernemental intéressé. Des informations ont également été demandées aux spécialistes (personnes ou organisations), et les groupes de spécialistes de la Commission de sauvegarde des espèces de l'UICN en furent parmi les principales sources. Il a également été fait appel aux organisations du commerce et autres parties intéressées. Un projet de rapport a été présenté à la deuxième session du

Comité technique CITES en juin 1986. Ce rapport a été examiné et amendé par le comité et des versions révisées ont été transmises par le Secrétariat CITES aux Etats de l'aire de répartition et aux personnes intéressées, dont le Pet Industry Joint Advisory Council. Les modifications finales et des données commerciales récentes ont été ajoutées au texte, par le CMC, au cours de 1987.

Dans un petit nombre de cas, la catégorie à laquelle une espèce avait été attribuée lors de la deuxième session du Comité technique a, par la suite, été modifiée sur la base des nouvelles informations reçues, en particulier les données commerciales de 1985 qui ont été ajoutées aux rapports.

Les informations ont été recueillies et rassemblées sous les titres suivants: répartition; population; habitat et écologie; menaces pour la survie; commerce international; mesures de conservation; et élevage en captivité.

Les données commerciales CITES ont été analysées pour les années 1980 à 1985, sur la base des rapports annuels des Parties à la Convention dont les statistiques sont conservées sur ordinateur par le CMC. Ces données comprennent les importations et exportations des espèces figurant aux annexes à la CITES et de leurs produits. Elles contiennent des informations sur les espèces en question, une description du type de produits et leur quantité et, dans le cas des importations, mentionnent l'exportateur ou le ré-exportateur et le premier pays producteur, et, pour les exportations, la destination et la source d'origine. En ce qui concerne le commerce entre deux pays Parties à la CITES, chaque transaction devrait donc être enregistrée deux fois, une fois par l'importateur et une fois par l'exportateur. Ainsi que le Groupe de travail sur le commerce important d'espèces de l'Annexe II l'avait suggéré, l'analyse a été, pour l'essentiel, limitée au commerce des animaux vivants et aux produits non-travaillés; cependant, dans un petit nombre de cas exceptionnels, des produits travaillés y ont été inclus.

Divers problèmes réduisent la valeur des données commerciales CITES pour l'évaluation des niveaux du commerce mondial. Par exemple: toutes les nations faisant du commerce ne sont pas Parties à la CITES; les Parties à la CITES ne présentent pas toutes des rapports annuels; et les rapports présentés sont de qualité variable et le sont de manière irrégulière. Certains pays font état du nombre de spécimens couverts par les permis émis, tandis que d'autres indiquent le nombre réel de spécimens pour lesquels le permis a été utilisé. En outre, il se peut que des exportations ayant lieu en fin d'année arrivent dans le pays d'importation au début de l'année suivante et, dans de tels cas, il est possible que la même transaction soit enregistrée dans les tableaux relatifs aux données commerciales des deux années. Il s'agit de tenir compte de ces facteurs, et d'autres encore, dans l'analyse des données de la CITES; toutefois, pour la plupart des espèces, ces statistiques constituent l'unique source d'informations détaillées sur leur commerce international, et les rapports CITES sont en général précieux pour évaluer les niveaux approximatifs du commerce légal, la répartition géographique des voies empruntées par le commerce international et les tendances, au cours des ans, en ce qui concerne le volume du commerce et l'évolution des préférences à l'égard des produits.

Dans la plupart des cas, les données commerciales sont présentées en deux tableaux dans les exposés qui suivent. Le premier (le tableau 1 en règle générale) énumère, dans le détail, les importations nettes des pays d'importation dont le total donne une estimation du volume minimal du commerce mondial pour chaque année. Le second (le tableau 2 en règle générale) indique l'origine ou, dans les cas où l'origine n'a pas été indiquée, l'exportateur des spécimens commercialisés. Lorsque des spécimens ont été exportés vers un pays intermédiaire et réexportés par la suite, le commerce net minimal est alors calculé, en s'assurant que les quantités n'ont été enregistrées qu'une fois. Ainsi, le tableau indique, pour chaque année, la quantité minimale

d'articles commercialisés à partir de chaque pays d'origine. Cependant, certains articles pouvant être réexportés sans que le pays d'origine ne soit spécifié, il est possible qu'ils soient enregistrés deux fois dans le tableau 2. C'est la raison pour laquelle les totaux du tableau 2 sont généralement plus élevés que ceux du tableau 1.

INTRODUCCION

Antecedentes

La Convención Sobre el Comercio Internacional de Especies Amenazadas de Fauna y Flora Silvestres (CITES) fue elaborada en 1973 con el objeto de controlar el comercio de vida silvestre. Ese control se efectua asignando a las especies dos niveles de protección. Aquellas especies (o pequeñas poblaciones geográficas) que se encuentran amenazadas de extinción están incluidas en el Apéndice I de la Convención, y su comercio internacional está prohibido, excepto bajo circunstancias excepcionales. Aquellas especies que no corren peligro de extinción, pero que podrían estar amenazadas si su comercio no estuviera reglamentado, se incluyen en el Apéndice II de la Convención. Dichas especies pueden comercializarse a nivel internacional, pero las naciones concernidas deben asegurarse de que los niveles de comercio no representan una amenaza para las poblaciones silvestres remanentes. Este requisito se explica formalmente en el texto de la Convención, Artículo IV, párrafo 2 a), que exige que las autoridades de los países exportadores informen que la exportación de especímenes de esas especies "no perjudicará la supervivencia de esa especie". En el artículo IV, párrafo 3 se indica que el comercio de esas especies "debe limitarse a fin de conservarlas, a través de su hábitat, en un nivel consistente con su papel en los ecosistemas donde se hallan y en un nivel suficientemente superior a aquel en el cual esa especie sería susceptible de inclusión en el Apéndice I". Las autoridades del país exportador deberán controlar las exportaciones y tomar medidas para limitarlas cuando así se lo estime conveniente.

Durante la cuarta reunión de la Conferencia de las Partes en CITES, realizada en 1983 en Gaborone, Botswana, se reconoció que varios países exportadores de especímenes de especies del Apéndice II no podían determinar por sí solos si los niveles de comercio perjudicaban a las poblaciones silvestres. Por lo tanto, se recomendó (por medio de la Resolución Conf. 4.7) "que el Comité Técnico de CITES identifique las especies del Apéndice II que son objeto de un comercio internacional considerable, para las cuales la información científica disponible sobre su capacidad de resistir a tales niveles de comercio resulta insuficiente como para satisfacer los requisitos estipulados en el Artículo IV, párrafo 3 de la Convención, según la opinión de los Estados involucrados en el area de distribución". Se recomendó que, una vez que determinadas especies se hayan identificado, el Comité Técnico, junto con los Estados involucrados en el área de distribución, los Estados importadores y las organizaciones que poseen una experiencia en el manejo de la fauna y de la flora, "elaboren y negocien las medidas necesarias para asegurar el mantenimiento del comercio continuo de esas especies dentro de los límites previstos en el Artículo IV, párrafo 3, de la Convención".

Las discuciones iniciales respecto a la manera como el Comité Técnico identificaría las especies en cuestión (tal como se recomienda en la Resolución Conf. 4.7) se basaron en la premisa de que un importante volumen de comercio era evidencia suficiente como para justificar la preocupación. Sin embargo, un informe no publicado, que fue realizado en 1984 por el WTMU para la Secretaría CITES, llegó a las siguientes conclusiones en lo que se refiere a la percepción del problema relativo al volumen significativo de comercio:

- El concepto de volumen significativo de comercio puede definirse de dos maneras: el volumen significativo puede considerarse en términos absolutos (i.e. grandes cantidades), o en términos relativos (i.e. grandes cantidades en relación con la población y la biología de la especie).

- El volumen de comercio significativo absoluto no implica por sí solo que la especie esté amenazada por el comercio. Sin embargo, la comercialización de especies en números significativos absolutos puede tener un significado ecológico importante.

- El volumen de comercio significativo relativo está directamente ligado a la supervivencia de las especies concernidas, pero no se tienen pruebas de que esto este correlacionado con el volúmen de comercio significativo absoluto. Debido a su designación en los Apéndices, todo comercio de especies incluidas en CITES es de interés y debe ser vigilado.

- Considerar el volumen de comercio significativo absoluto como un criterio para la selección de especies para un cuidado especial es por lo tanto no solamente irrelevante en términos de conservación de especies, sino que puede también distraer la atención de casos más importantes.

El Grupo de Trabajo del Comité Técnico sobre el comercio significativo de especies del Apéndice II produjo un documento, basado en su reunión en Suiza en Diciembre de 1984, cuyo fin consistía en formular un procedimiento o una línea de conducta que permitiera al TEC cumplir con sus obligaciones en virtud de la Resolución Conf. 4.7. Se decidió que el Grupo debía limitar sus discusiones a la fauna, pues ya existía un Grupo de Trabajo para las plantas. Las conclusiones del informe del WTMU sobre gran volumen de comercio fueron endosados, y el Grupo convino en que no era posible identificar los taxa del Apéndice II más preocupantes basándose solamente en los datos comerciales. Para evaluar correctamente el efecto del comercio sobre esos taxa era necesario poseer información sobre la situación biológica, sobre la tendencia de las poblaciones y sobre toda una serie de otros factores.

Se convino en un procedimiento de cinco etapas como siendo el mecanismo más favorable para la aplicación de la Resolución Conf. 4.7. Dicho procedimiento se presentó durante la quinta reunión de la Conferencia de las Partes que se realizó en Buenos Aires, Argentina, en 1985 (Doc. 5.26). Los pasos 1-3 ya han sido realizados.

1ra. etapa: Elaboración de una lista "A"

Se reconoció que, salvo algunas pocas excepciones, se puede razonablemente asumir que un taxón incluido en el Apéndice II puede soportar un cierto grado de explotación con fines de comercio internacional. El Grupo decidió fijar una cantidad a un nivel "prudente" de comercio para todos los taxa del Apéndice II, en término medio, de menos de 100 ejemplares por año de un taxón incluido en el Apéndice II, que son obtenidos de la naturaleza (en forma global) y que entran anualmente en el comercio.

De esta forma, eliminando todos los taxa que no están concernidos por el comercio internacional o que están concernidos solamente a un nivel mínimo, se obtiene una lista de taxa "candidatos potenciales" (lista "A"). Esos taxa se definen como aquellos que podrían ser objeto de un comercio internacional significativo.

La lista "A" fue preparada por la WTMU, utilizando el promedio de las estadísticas comerciales CITES ofrecidas por las Partes en el período 1980-1982. Se incluyeron en el análisis los datos relativos a los especímenes vivos (excluyendo los especímenes criados en cautividad), las pieles enteras o substancialmente enteras, las pieles de los flancos/lados, las napas de pieles, los caparazones, los trofeos y otros artículos no trabajados, etc. Las especies que nunca fueron registradas en el comercio, con excepción de aquellas incluidas en el Apéndice II como parte de un taxón superior o por razones de semejanza, fueron listadas

separadamente para que se tomara en consideración su retiro de los Apéndices.

2da. etapa: Elaboración de una lista "B"

El Grupo convino que algunos taxa pueden ser eliminados de las especies de "comercio significativo" basándose en los conocimientos disponibles relativos a su situación. Luego de este proceso, los taxa remanentes constituyen la lista "B", formada por aquellos taxa con "posibles problemas". Además, agregaron a esa lista dos especies (*Tupinambis rufescens* y *Papustyla pulcherrima*) bajo circunstancias especiales, donde se pone en evidencia un problema, a pesar del bajo volumen de comercio registrado.

3ra. etapa: Elaboración de una lista "C"

El paso siguiente del procedimiento consistía en evaluar las informaciones disponibles para cada una de las especies de la lista "B" y en eliminar las especies que, sobre la base de la opinión de expertos, no presentan problemas. Esta parte de la operación significaba tener que reunir el máximo de información posible con respecto a cada especie y evaluar el efecto del comercio conocido sobre la población conocida. El Grupo convino que, para cada especie, se debía acordar una importancia primordial a la situación global, pero que, si una especie estaba aparentemente afectada por un comercio a nivel nacional o regional, se lo debía mencionar en un suplemento anexado a la lista. Las especies de la lista "C" deberían distribuirse en dos grupos: en primer lugar las especies para las cuales las informaciones corrientes o el conocimiento de su biología y/o de su manejo demuestran que la población se halla afectada por la explotación debido al comercio internacional (Lista 1); y, en segundo lugar, las especies para las cuales las informaciones disponibles o los conocimientos son insuficientes como para servir de base a un juicio de ese tipo (Lista 2).

4ta. etapa: Elaboración de medidas correctivas

El TEC, o un grupo de trabajo del TEC constituido a ese efecto, debía examinar las listas "1" y "2", y establecer prioridades dentro de cada lista. Para las especies o grupos de especies de la lista "1" de gran prioridad, se debían convocar sesiones de trabajo con el objeto de recomendar medidas correctivas. Las medidas correctivas examinadas debían comprender, sin necesariamente limitarse a esto: la preparación de propuestas para transferir las especies en cuestion al Apéndice I, la elaboración de procedimientos de manejo suplementarios ya sea en favor de las poblaciones silvestres (tales como cupos de caza, temporadas de caza, tamaños límites de los especímenes, etc.) o bien en lo que se refiere a los controles del comercio, y la inclusión de taxa por razones de semejanza.

Para las especies de la lista "2", de gran prioridad, se deberían establecer proyectos con el objeto de recabar información sobre su biología y manejo. Cuando esas informaciones demuestren la necesidad, la especie debería transferirse a la lista "1".

5ta. etapa: Aplicación de las medidas correctivas

Las medidas correctivas deberían ser desarrolladas por los Estados del área de distribución concernida, sobre la base de las recomendaciones formuladas en las sesiones de trabajo.

Este procedimiento de cinco etapas fue aprobado en la reunión de Buenos Aires en 1985 y las etapas 1-3 ya fueron desarrolladas por el Centro UICN de Vigilancia Continua de la Conservación. La lista "C" fue preparada a tiempo para la segunda reunión del Comité Técnico realizada en Junio 1986 en Lausanne, Suiza. Para cada especie incluida en la lista "C", se preparó un borrador presentando un resúmen de toda la información disponible, incluyendo un análisis detallado de referencias e información disponible sobre el comercio y sobre el estado de la población y otros factores que se consideraron importantes. Basado en esta información, cada especie fue asignada a las dos listas sugeridas (lista 1, especies con problemas; lista 2, problemas posibles). En esta etapa se descubrió también que era posible que algunas especies, originalmente incluidas en la lista "C", no se vieran afectadas en forma significativa debido a los presentes niveles de comercio. Dichas especies fueron incluidas en un tercer grupo (lista 3, sin problemas). El Grupo de Trabajo del Comité Técnico sobre el comercio significativo de especies revisó la información proporcionada por el CMC, así como los listados presentados, y preparó recomendaciones para una acción ulterior, las cuales se ennumeran a continuación. El Comité Técnico decidió asimismo que, después de revisión ulterior, el informe preparado por el CMC debía ser publicado.

Acción ulterior

El Grupo de Trabajo sobre el Comercio Significativo de Especies presentó un documento durante la segunda reunión del Comité Técnico en el que se delineaban propuestas para acciones ulteriores (WGR.TEC. 2.2). A continuación se describen las recomendaciones de dicho informe para las especies de reptiles concernidas, las cuales fueron modificadas durante la reunión del Comité Técnico.

Lista 1 (4 taxa)

Podocnemis expansa - Cabe suponer que los datos relativos al comercio son sumamente exagerados como consecuencia de una identificación errónea. La Secretaría deberá informar a las Partes acerca de las prohibiciones vigentes sobre el comercio y Venezuela se encargará de preparar una propuesta para la transferencia de la especie al Apéndice I teniendo en cuenta de que el comercio internacional es probablemente insignificante.

Caiman crocodilus - Para tratar este problema, la Secretaría está realizando proyectos en Bolivia, Brasil y Paraguay. Se necesita financiación para un segundo proyecto (Brasil, Colombia y Venezuela). Se deberían realizar estudios sobre la población en América Central. Debería recolectarse y analizarse información sobre antecedentes en el comercio, incluyendo cantidades y tamaño de las pieles,. En los lugares en los que las especies sean legalmente explotadas, deberán establecerse cupos nacionales para la extracción del medio silvestre.

Geochelone chilensis - Se considera apropiado el plan de manejo que ha asumido Argentina.

Tupinambis spp. - Argentina ha iniciado una acción para revisar sus cupos de extracción del medio silvestre. Es posible que el comercio ilegal siga siendo un problema y la Secretaría deberá evaluar las estadísticas relativas al comercio en 1984/1985, identificar cualquier país importador que autorice el comercio a partir de países exportadores donde existe una prohibición sobre las exportaciones, y pedir que se tomen las medidas del caso a fin de poner término al problema. El Comité de Nomenclatura deberá aclarar el aspecto taxonómico.

Lista 2 (17 taxa)

El Grupo de Trabajo recomendó que los siguientes taxa (enumerados por orden de importancia) se consideraran como especies o grupos de especies prioritarios:

1. Varanidos asiáticos (tres especies, es decir, *Varanus salvator* y las especies del Apéndice I *V. bengalensis* y *V. flavescens*).

2. Pitones asiáticos (tres especies, es decir, *Python curtus*, *P. molorus bivittatus* y *P. reticulatus*).

3. Lagartos Africanos (dos especies, es decir, *Varanus exanthematicus* y *Varanus niloticus*), haciendo notar que el proyecto deberá concentrarse en los aspectos necesarios para evaluar los niveles de explotación sostenidos para las especies.

4. Boas sudamericanas (tres especies, es decir, *Boa constrictor, Eunectes murinus* y *Eunectes notaeus*).

5. *Papustyla pulcherrima*.

Además, el Grupo formuló las recomendaciones especiales siguientes:

Dracaena guianensis: Las Partes que poseen poblaciones de *Dracaena* spp. deberán aclarar su situación en lo que se refiere a la distribución y considerar la inclusión de *Dracaena* spp. en el Apéndice II.
Crocodylos porosus: Deberá recomendarse con urgencia al Grupo UICN/CSE una revisión del programa de manejo para esta especie a la luz de los resultados del reciente informe de Indonesia.

Lista 3 (15 taxa)

Se acordó en que la información disponible indicaba que esos taxa no estaban esencialmente afectados por el comercio internacional.

METODOS

Este informe incluye la revisión del estado biológico y comercial de especies que aparecen en la lista "C". Este informe ha sido realizado por el Centro UICN de Vigilancia Continua de la Conservación, bajo contrato con la Secretaría CITES, cubriendo el periodo Septiembre de 1985 a Abril de 1986. Como paso inicial, la Secretaría CITES circuló, a traves de las Autoridades Administrativas CITES de los Estados miembros en la Convención, o a traves de las Autoridades Administrativas responsables de fauna u otras autoridades equivalentes en los estados no Partes en la Convención, una solicitud de información a todos los países en los que se encuentran las especies de la lista "C". Los comentarios recibidos fueron enviados a la CMC y se clasificaron de la siguiente manera: Nombre del país de la Autoridad Administrativa CITES, 1987. Los comentarios recibidos de las autoridades responsables de los Estados no Partes fueron clasificados por nombre de la autoridad gubernamental concernida. También se solicitó información de especialistas concernidos (personas o agencias), y entre las fuentes principales se encontraban los grupos de especialistas de la Comisión de Supervivencia de Especies de la UICN. También fueron consultadas algunas organizaciones comerciales y otras Partes interesadas. Un informe borrador se presentó en la segunda reunión del Comité Técnico CITES en Junio de 1986. Este informe fue discutido y corregido por el Comité y las copias, una vez revisadas, fueron nuevamente enviadas por la Secretaría CITES a todos los países concernidos y a las partes interesadas, incluyendo el Pet Industry Joint Advisory Council. Las modificaciones finales al texto, así como la

información sobre el comercio reciente, fueron incluidas por el CMC durante 1987.

Por lo tanto, en la minoría de los casos, la designación de la categoría de una especie al realizarse la segunda reunión del Comité Técnico ha sido modificada a la luz de nueva información, en particular la información comercial de 1985 que ha sido agregada a los informes.

Se recolectó e incluyó la información bajo los siguientes títulos: distribución; población; habitat y ecología; amenazas a la supervivencia; comercio internacional; medidas de conservación; y cría en cautividad.

Los datos sobre el comercio CITES fueron analizados para los años 1980 a 1985, utilizando los Informes Anuales de las Partes de la Convención, cuyas estadísticas han sido procesadas en el computador del CMC. Esta información incluye el registro de importaciones y exportaciones de especies de los Apéndices de CITES, así como sus productos, y contienen información sobre las especies concernidas, una descripción del tipo y la cantidad del producto, y, en el caso de importaciones, el exportador o re-exportador y los principales países de origen, y, para las exportaciones, el destino y la fuente de origen. En lo que concierne al comercio entre dos Partes en CITES, cada transacción debería por lo tanto registrarse dos veces: una vez por el importador y otra por el exportador. Tal como sugirió el Grupo de Trabajo sobre el Comercio Significativo, el análisis se restringió al comercio de animales vivos o de productos no trabajados, sin embargo, también se incluyeron productos terminados en un número pequeño de casos excepcionales.

Varios problemas reducen el valor de la información comercial de CITES en la evaluación de los niveles del comercio mundial. Por ejemplo: no todas las naciones que realizan comercio son Partes en CITES; no todas las Partes en CITES elaboran informes anuales, y la presentación de los informes varían en calidad y regularidad. Algunos países pueden proporcionar información sobre lacantidad de especímenes que cubren los permisos expedidos, mientras que otros proporcionan información sobre la cantidad real por la cual se utilizó el permiso. Más aún, las exportaciones de un país al finalizar un año pueden arrivar al país importador al comienzo del año siguiente, y en tales casos es posible que, por la misma transacción, se registren en los cuadros comerciales para ambos años. Estos factores y otros deben tomarse en cuenta cuando se analizan los datos de CITES, pero para la mayoría de las especies, estas estadísticas representan la única fuente detallada de información respecto a su comercio internacional y generalmente los informes CITES son de gran utilidad al evaluar los niveles aproximados de comercio legal, así como los patrones geográficos en tal comercio y las tendencias relativas a los volúmenes de productos preferenciales, en un determinado lapso de tiempo.

En la mayoría de los casos, los datos comerciales son presentados en los dos cuadros siguientes. En el primero (normalmente Cuadro 1), se detallan las importaciones netas de países importadores, cuyo total nos proporciona una cifra estimada del volumen mínimo de comercio mundial anual. El segundo (normalmente Cuadro 2) muestra el origen, o en los casos en los que el origen no se menciona, el exportador de los especímenes en cuestión. Cuando los especímenes han sido exportados a un país intermediario y posteriormente reexportados, el comercio mínimo neto ha sido calculado, asegurándose de que los números sólo fueron registrados una sola vez. Por lo tanto, el cuadro muestra, anualmente, la cantidad mínima de artículos de comercio de cada país de origen. Sin embargo, ya que algunos artículos pueden ser reexportados sin que necesariamente aparezca especificado el país de origen, éstos pueden ser registrados dos veces en el Cuadro 2. Por lo tanto, los totales son usualmente más altos que los que aparecen en el Cuadro 1.

CHACO TORTOISE

Recommended list: 1
[Problem]

Geochelone chilensis (Gray, 1870)

Order TESTUDINES

Family TESTUDINIDAE

SUMMARY AND CONCLUSIONS A medium size terrestrial tortoise, restricted to rather arid lowlands, mainly in the Chaco region, in southern South America. Ranges from Paraguay and possibly adjacent Bolivia through much of Argentina. Is classified as Insufficiently Known in the IUCN Amphibia-Reptilia Red Data Book. Mainly herbivorous. Clutch comprises up to six eggs. Two new species have recently been described from within the range of *G. chilensis sensu lato*; these are not widely recognised and may not be distinct species, although new information suggests that the large, montane form (*donosobarrosi*) may be sympatric with *G. chilensis*.

Central and northern populations in Argentina are reportedly in marked decline due to over-exploitation for the international live animal trade. Large numbers have been exported through Bolivia mainly to U.S.A. From 1980 to 1984, the number in reported trade increased very sharply from 5 to 8111, but declined again in 1985.

Field study on population levels and the sustainability of the reported and alleged unreported trade is required, as is clarification of the claimed ranching or farming operations in Argentina.

DISTRIBUTION Rather widespread in the dry lowlands of central South America, centred on the Chaco zone; extends from Paraguay south through much of north and central Argentina, into the northern fringes of Patagonia.

One authority (Freiberg, 1973, 1981) regards tortoises in the western part of the Argentinian Chaco, around Santiago del Estero and La Rioja, as a full species *G. petersi*, and those from the Patagonian portion of the range, between La Pampa (37.3°S) and the Rio Negro (41°S), as *G. donosobarrosi*. Most other authorities have preferred to retain the conventional treatment pending further study. It has recently been proposed (Bour, 1980) that several taxa usually recognised as subgenera of *Geochelone* should be elevated to generic rank, as *Chelonoides* in the case of the *chilensis* complex. This usage is not widespread.

Argentina Rather widely distributed, from the Chaco zone in the north, south to around 41°S; recorded from the provinces of Buenos Aires, Catamarca, Cordoba, Chaco, Chubut, Formosa, La Pampa, La Rioja, Mendoza, Neuquen, Rio Negro, Salta, San Juan, San Luis and Santiago del Estero (Auffenberg, 1969; Freiberg, 1981; N. Scott, *in litt.* 23 December 1981). Waller (1986) listed known localities and estimated that the distribution covered 29-30% of the continental land area of the country.

Bolivia Although no published records exist, the species "undoubtedly" (Auffenberg, 1969) occurs in the Gran Chaco of southern Bolivia.

Paraguay Widely distributed in the Chaco zone of north-west Paraguay; recorded from the departments of Boqueron, Chaco, Nuevo Asuncion and Presidente Hayes (N. Scott, *in litt.* 23 December 1981). Waller (1986) listed two records from Boqueron.

Uruguay The species has been reported to occur in Uruguay (Honegger, 1981), but there appear to be no published records from this country.

Geochelone chilensis

POPULATION Reportedly in marked decline in the main part of the range, comprising the Argentinian Chaco, apparently relatively secure in Paraguay.

Argentina Northern and central populations reported to be declining severely, but southern populations ('*G. donosobarrosi*') appear secure, although existing in low density (Freiberg, 1974, 1981). In the late 1960s a maximum density of 15-20 *G. chilensis* per acre were recorded in optimum habitat in Cordoba (Auffenberg, 1969). In general, reported to be not so widespread and abundant as often said, and to be patchy in distribution (J.M. Cei, *in litt.* to F.W.King, 14 June 1978). Gruss and Waller (1986) cited no evidence of population decline but claimed that habitat destruction was a major threat and had caused a severe reduction in range.

Bolivia No information.

Paraguay Reasonably abundant in much of the range, the majority of which is difficult of access; no evidence for decline (N. Scott, *in litt.* 23 December 1981).

HABITAT AND ECOLOGY A medium-size terrestrial tortoise, inhabiting arid lowlands, most typically in thorny chaco habitats (Auffenberg, 1969; Pritchard, 1979). Population density at one site, near La Posta, Cordoba (Argentina) was between 15-20 tortoises per acre. Although the species ranges into semi-arid intermontane basins in western Argentina, densities are highest in the chaco region. Mainly herbivorous, consuming the fruit of various trees and shrubs, pads and fruit of cacti, and grasses (Auffenberg, 1969). Shallow pallets are excavated, deep enough to cover the anterior third or half of the shell, in which nights and much of the day are spent; a somewhat deeper pallet is formed for shelter during cold and dry periods. Each tortoise has an activity range of about 30 m from the pallet being used. Courtship occurs in November-December and a clutch of 1 to 4 round white eggs, c 4.5 cm diameter, is laid in January; there is some evidence that two clutches of 1-3 eggs may be laid in one year (Auffenberg, 1969).

THREATS TO SURVIVAL Threatened by heavy exploitation for the live animal trade, by increasing habitat destruction owing to timber extraction and conversion of forest and scrub to agricultural land (Salas, 1985; Gruss and Waller, 1986); local utilisation as a food source may also have an adverse effect in conjunction with these factors. These activities seem to be most prevalent in the province of Santiago del Estero, said to show more severe habitat destruction than any other province, and a centre for the wildlife trade (Salas, 1985). Tortoises collected that are not sold for the wildlife trade may be eaten by local inhabitants, although the meat is not especially favoured (Salas, 1985). Said to be exported to Santiago (Chile) for food use (Auffenberg, 1969). In the 1970s very large numbers of young and adults were sold or exported, about 4000 tortoises monthly in Mendoza Province. Most of these animals were sent to Chile and other countries, with an estimated mortality in transit of around 70% (J.M. Cei, *in litt.* to F.W.King, 14 June 1978). Gruss (1986) conducted a questionnaire survey in Buenos Aires which concluded that 63% of the population had bought or owned *G. chilensis* as pets. He estimated that this could account for an offtake of 75 000 tortoises from the wild each year to supply the demand in the city and its surroundings.

INTERNATIONAL TRADE Reportedly "tens of thousands" of *G. chilensis* are collected annually in Argentina for the national and international pet trade (Salas, 1985). In the north and centre of Argentina *G. chilensis* (including *G. petersi*) are collected, taken to Buenos Aires and then exported in thousands (with other wildlife) via Bolivia to USA (notably Los Angeles)

(Freiberg, 1981). A number of 'hatcheries' or farms of some description exist which claim to supply captive-bred tortoises to the trade; it is alleged that most such operations exist simply as a cover for massive collection from the wild (Salas, 1985). European trade in live *G. chilensis* may increase in the future as EEC countries prohibited the import of European *Testudo* species in 1984 (Honegger, 1984), although no such increase was apparent in 1985. The numbers of *chilensis* in trade reported to CITES is not as large as the overall numbers said to be entering the pet trade (Salas, 1985; M.A. Freiberg, *in litt.* 16 March 1981); this implies that there is an extensive unreported trade. The number of live animals in reported trade increased very steeply between 1980 and 1985, but then fell again in 1985.

Table 1. Apparent minimum net imports of live *G. chilensis* reported to CITES, 1980-85 (including one shell imported to USA).

	1980	1981	1982	1983	1984	1985
Bermuda	-	-	-	6	-	-
Canada	-	-	-	-	15	-
Chile	-	-	-	-	50	-
Denmark	-	-	-	6	10	6
Germany, F.R.	-	195	-	2	570	-
Japan	-	42	-	361	72	-
Netherlands	-	-	-	-	162	-
Switzerland	-	32	-	-	-	-
UK	-	24	-	-	-	-
USA	5	540	1430	2653	7225	647
USSR	-	-	-	-	7	6
TOTAL	5	833	430	3028	8111	659

Table 2. Reported countries of origin (or exporting country if no original source reported) and quantities of transactions in live *G. chilensis* reported to CITES.

	1980	1981	1982	1983	1984	1985
a. Countries having or possibly having wild populations of *G. chilensis*						
Argentina	4	215	1400	2928	8111*	655*
Bolivia	1	7	-	100	-	-
Chile	-	-	-	-	-	4
Paraguay	-	611	30	-	-	-

*2951 of these said to be captive bred in 1984 and 530 in 1985.

b. Countries without wild populations

U.S.A.	-	-	-	-	6	-

CONSERVATION MEASURES Existing laws should be adequately enforced and international trade restricted. The taxonomic status of '*G. petersi*' and '*G. donosobarrosi*' requires investigation.

Argentina All tortoises are protected from hunting and trade in Argentina (Ley No. 22.421), but this legislation is said not to be enforced (Freiberg, 1974).

Bolivia A ban on the export of all wildlife was imposed in 1984 (Resolucion Ministerial No 85/84). This was extended in 1985 to cover all wildlife products, with very few exceptions (Resolucion Ministerial No 2262/85).

Paraguay Export of wildlife from Paraguay is prohibited except under permit; reportedly (N. Scott, *in litt.* 23 December 1981) permits are now issued only for scientific specimens.

Uruguay All hunting and trade of wild animals, with very few exceptions, is prohibited in Uruguay under Ley No. 9.481.

CAPTIVE BREEDING A number of operations said to be 'commercial breeders' of *G. chilensis* exist in Argentina (Salas, 1985). A recent inventory (Slavens, 1985) reports 23 *chilensis* in 8 collections responding to a questionnaire. Captive breeding prospects are reportedly poor; survival rate in captivity is very low, due to distinct environmental requirements (Honegger, 1979).

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LEOPARD TORTOISE

Recommended list: 2*
[Potential problem]

Geochelone pardalis (Bell, 1828)

Order TESTUDINES

Family TESTUDINIDAE

*The category has been changed from 3 to 2 since approval by the CITES TEC Meeting in 1986 owing to the increased trade reported in 1985.

SUMMARY AND CONCLUSIONS A widely distributed species occurring over much of southern and eastern Africa from Sudan, Ethiopia and Somalia south through Kenya, Uganda, Tanzania, Mozambique, Malawi, Zambia, southern Angola, Zimbabwe, Botswana, Namibia to South Africa. Two subspecies have been recognised but their validity is disputed. Likely to be relatively rare in easily accessible areas, although no data are available on population size. An inhabitant of coastal plains and upland savanna, this species is primarily herbivorous. Breeding takes place in spring in South Africa and over a longer period elsewhere. Up to thirty eggs are laid. Threats to this species appear to be hunting for food (eggs and meat) and possibly capture for the pet trade. It breeds readily in captivity.

The apparent minimum trade volume reported to CITES for the period 1980-1985 was 3392 specimens, virtually all live animals. Tanzania was the major exporter in 1985, taking the place of Kenya which predominated in 1980 and 1981. F.R. Germany and the USA were the principal importers. Trade increased sharply in 1985, mostly because of exports from Tanzania to F.R. Germany and the USA. The species is theoretically protected in Tanzania.

It seems unlikely that the overall trade levels reported to CITES pose a significant threat to the species, but the apparent sudden rise in illegal exports from Tanzania, and to a lesser extent Kenya, is of concern. They may be in response to the prohibition on imports of European tortoises to the EEC imposed in 1984.

DISTRIBUTION Widely distributed over much of southern and western Africa, having been reported from Sudan, Ethiopia and Somalia south through Kenya, Uganda, Tanzania, Mozambique, Malawi, Zambia, southern Angola, Zimbabwe, Botswana, Namibia to South Africa, possibly including Lesotho and Swaziland (Loveridge and Williams, 1957; Greig and Burdett, 1976). Two subspecies are recognised, although Greig and Burdett (1976) doubt their validity. However, Pritchard (1979) was of the opinion that further study would lead to naming of more such taxa.

G. pardalis pardalis Now only known from Namibia, though it may previously have occurred in South Africa. Although there are reports to the contrary, it does not occur in Angola (Loveridge and Williams, 1957). This subspcies is not thought to be distinct from *G. p. babcocki* (South African CITES MA, 1987).

Namibia Probably only south of the line from near Luderitz Bay to Keetmanshoop (Pritchard, 1979; Loveridge and Williams, 1957). It may, however, occur as far north as Rehoboth (Loveridge and Williams, 1957).

South Africa In the past it probably also occurred within South Africa, possibly as far south as the Cape of Good Hope, and around the Oliphants River (Loveridge and Williams, 1957).

Geochelone pardalis

G. p. babcocki More widely distributed and occurs from Sudan, Ethiopia and Somalia, southward through Kenya, Uganda, Tanzania, Mozambique, Malawi, Zambia, Zimbabwe, Botswana, Angola, to Namibia and South Africa. Loveridge and Williams (1957) refuted reports from Madagascar and the Senegambia region.

Angola Recorded inland from Benguela, Capangombe, Cubal, Dombodola, Forte Rocadas, Mopa and the interior of Mossamedes. Absent from the north of the country (Loveridge and Williams, 1957).

Botswana Recorded from Gemsbok, Kalahari, Magalapsi, Makarikari, Maun, Serowe, Shaleshonto, Shorobe, Tsotsoroga Pan and Mababe Flats (Loveridge and Williams, 1957; Greig and Burdett, 1976).

Ethiopia Recorded from the south of the country at: Ado-Shebeli Valley, Araro, Arenda, Artu, Arussi Gallaland, Boorgha, Caschei, Dabas, En, Erre, Javello, Lake Abaya, Lake Zwai, Neghelli, Shoa, Sibi, Harrar, Soddu, (Loveridge and Williams, 1957).

Kenya Recorded from numerous localities from around the country (Loveridge and Williams, 1957). Widespread in drier savannah, though not deserts (A. Mackay, *in litt.*, 26 March 1986).

Lesotho The species is said to occur in Lesotho (Ministry of Agriculture and Marketing, Lesotho, *in litt.*, 1985), although Greig and Burdett (1976) located no records, and Branch and Brack (1987) indicate that it may be absent.

Malawi Occurs south of the Mwanza River and west of the Shire in both Chikwawa and Port Herald Districts (Loveridge and Williams, 1957).

Mozambique Recorded from Cape Delgado, Kasumbadedza, Sena and Tete (Loveridge and Williams, 1957). The species is said to be widespread throughout the country (Mozambique CITES MA, 1986).

Namibia Recorded from several localities, it meets with *G. p. pardalis* in southern Namibia, but is dominant north of 25°S (Loveridge, 1957).

Somalia Recorded from Hargeisa, Nogal Valley, Toyo Plain, between Bardale and Condut, Pozzi-Ircudt, Jet, "Sahaaieroi" (Loveridge and Williams, 1957).

South Africa Recorded from Natal, Transvaal, and numerous localities in the Cape Province (Loveridge and Williams, 1957). There are no records from the Western Cape, the central Cape Karroid areas, the highveld regions of the Orange Free State, southern Natal or Transkei (Greig and Burdett, 1976; Branch and Braak, 1987). Transport and release of pets around the country regularly occurs and results in their occurrence in semi-urban areas (Greig and Burdett, 1976). This may mask any local genetic variation (South Africa CITES MA, 1987).

Sudan Recorded from the south of the country at: Bahr el Ghazal, Bahr el Jebel, Bor, Gondokoro, Lado Enclave and Mongalla (Loveridge and Williams, 1957).

Swaziland Recorded as being included in the distribution (Groombridge, 1983), but no records have been located although it occurs very close to the border (Greig and Burdett, 1976).

Tanzania Recorded from numerous localities from around the country (Loveridge and Williams, 1957). Said to be widespread (K. Howell, *in litt.*, 15 March 1986).

Uganda Recorded from Mount Debasien (Loveridge and Williams, 1957). Said to occur widely throughout the country (Uganda Game Department, *in litt.*, 1987).

Zambia Recorded from Luangwa River and Pitauke (Loveridge and Williams, 1957). Said to be widespread throughout the country but absent above 1 830 m on the Nyika Plateau (Wilson, 1968).

Zimbabwe Recorded from Birchenough Bridge, Sabi River, Gwamayaya River and Mount Darwin (Loveridge and Williams, 1957; Greig and Burdett, 1976).

POPULATION Little information is available regarding the current status of the populations of this species. Loveridge and Williams (1957) did not provide evidence to suggest that *G. p. babcocki* was rare, indeed they quote Peel's (1900) observation of "an army of monsters migrating across the desert". Pritchard (1979) reported that, in easily accessible areas, Leopard Tortoises may be relatively rare.

Angola No information.

Botswana No information.

Ethiopia No information.

Kenya The species is widespread, but never occurs in large numbers (A. Mackay, *in litt.*, 26 March 1986).

Malawi No information.

Mozambique The species is said to be abundant in Gorongosa National Park and the Gilé Game Reserve, common in Banhine and Zinave National Parks and Niassa Game Reserve, and rare in Maputo and Marromeu Game Reserves. It has declined and is now rare in cultivated areas. As the species is actively hunted for food (Mozambique CITES MA, 1986), it is likely to have come under severe pressure in the recent famine.

Namibia Said to be abundant in Etosha and fairly abundant in other conservation areas in the north-east (Bushmanland, Kavango, etc.). It is locally extinct in all communal areas (Department of Agriculture and Nature Conservation, Namibia, *in litt.*, 1987).

Somalia No information.

South Africa Said to be very common in the eastern Cape Province, and the lowveld regions of Transvaal, but scarce elsewhere (Branch and Brack, 1987).

Sudan No information.

Tanzania Not considered threatened in Tanzania (K. Howell, *in litt.*, 15 March 1986).

Uganda No information.

Zambia Said to be common throughout the country (Wilson, 1968).

Zimbabwe Broadley (*in litt.*, 18 March 1986) considered this tortoise to be scarce near densely populated communal lands but common in sparsely inhabited areas.

Geochelone pardalis

HABITAT AND ECOLOGY Leopard Tortoises inhabit coastal plains and upland savanna and may be found in rather sandy, thornbush steppes and on kopjes and stone strewn hills with scattered scrub. Not found in of primary forest. *G. p. babcocki* is often found on mountain masses, and has been recorded at a height of 9 000-10 000 feet on Mt. Elgon, Uganda (Loveridge and Williams, 1957). The diet includes grasses, a variety of succulents, also fallen fruit and crop plants such as beans and watermelons (sources in Pritchard, 1979). The species can apparently exist without water for long periods.

Males compete for females in the breeding season by pushing and butting. Nesting takes place in spring in South Africa (September-October) but the season is longer in tropical Africa. Nest holes vary in size to a maximum recorded depth of 1 foot and may contain up to 30 eggs. These hatch in 8-18 months depending on the weather conditions (Loveridge and Williams, 1957). Leopard Tortoises appear to have a well developed homing ability and have been observed moving *en masse* (Peel, 1900 in Loveridge and Williams, 1957; Pritchard, 1979).

THREATS TO SURVIVAL Flooding and grass fire have both been identified as the cause of deaths of large numbers of leopard tortoises. They are preyed on by a variety of animals - crows, ground hornbills, ratels, hyenas and soldier ants, and eggs may be dug up and devoured by jackals, dogs, and viverrids (Loveridge and Williams, 1957). The food value of *G. p. pardalis* may have led to its extermination in parts of the Cape (Loveridge and Williams, 1957). Bushmen also prize *G. p. babcocki* for its shell which may be used for ladling or holding water and also to make snuffboxes (Fitzsimmons, 1935 in Loveridge and Williams, 1957).

Botswana Auerbach (1985) reports that this species is prized by man for its meat, eggs and shell.

Kenya In Kenya generally the species seems to little persecuted, if at all, and is often accorded a respectful title, such as 'tortoise elder' (A. Mackay, *in litt.*, 26 March 1986).

Lesotho There is said to be no trade in any wild fauna in Lesotho (Ministry of Agriculture and Marketing, Lesotho, *in litt.*, 1985).

Mozambique The species is not traded but is said to be actively hunted for food and to be particularly depleted by fires which are common in cultivated areas for bush clearance (Mozambique CITES MA, 1986).

Namibia The species has been hunted for food to the point of extinction in all communal areas. Hunting also occurs to a lesser extent in other areas (Department of Agriculture and Nature Conservation, Namibia, *in litt.*, 1987).

South Africa Greig and Burdett (1976) reported that the meat and eggs of *G. pardalis* were highly regarded in some areas; and attributed its absence from the western Cape to past persecution. Branch and Braak (1987) suggested that the absence from southern Natal and Transkei might be similarly due to human predation. They reported that one tortoise had died after becoming trapped in an Aardvark hole.

Tanzania *G. pardalis* is said not to be persecuted in Tanzania, though increasing numbers are exported for the live pet trade (K. Howell, *in litt.*, 15 March 1986).

Uganda Some tribes consider this species a delicacy, mainly in the north of the country and Karamoja, but there is little other persecution. No trade has been reported (Game Department, Uganda, *in litt.*, 1987).

INTERNATIONAL TRADE Listed on CITES Appendix II. The principal data available relating to international trade are those contained in the Annual Reports of the Parties to CITES. These are summarized in Tables 1 and 2.

Table 1: Minimum net imports of live *Geochelone pardalis* reported to CITES.

	1980	1981	1982	1983	1984	1985
Australia	-	-	6 *	-	-	-
Austria	-	4	-	-	-	4
Canada	-	-	-	-	-	4
Denmark	4	2	-	-	-	-
Dominica	4	-	-	-	-	-
Dominican Rep.	-	1	-	-	-	-
German D.R.	10	-	-	-	-	2
Germany, F.R.	345	9	2	-	-	1009
Israel	-	-	-	-	-	1
Japan	-	-	-	10	12	71
Namibia	-	-	-	-	1	-
Switzerland	82	260	-	-	-	16
UK	1	34	-	4	-	3
USA	376	413	4	81	35	558
Total	822	723	12	95	48	1675

Table 2: Reported countries of origin (or exporting country if no original source reported) and quantities of export of live *Geochelone pardalis* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having wild populations of *G. pardalis*						
Kenya	736	617	-	-	41	100
Namibia	66	10	-	-	-	-
Somalia	-	-	-	-	-	2
South Africa	-	2	9 *	34 *	6 *	-
Tanzania	-	-	-	150	-	1497
Uganda	-	2	-	-	-	-
Zimbabwe	-	-	-	-	-	18
Countries without wild populations of *G. pardalis*						
Australia	4	-	-	-	-	-
Germany, F.R.	-	-	-	-	-	1 *
Country unknown	-	-	3	-	1	-

* Captive-bred

Over 99% of all imports were live specimens, presumably mostly destined for the pet trade. The principal importers of *G. pardalis* were the USA and F.R. Germany. Imports dropped substantially in the years 1982, 1983 and 1984, but rose to a peak in 1985.

Geochelone pardalis

Kenya was the principal exporter until 1981 when an export ban was imposed, after which few exports were indicated. In 1983 and 1985, Tanzania was the source of the great majority of *G. pardalis*. South Africa principally exported captive-bred specimens. F.R. Germany re-exported a large number of animals notably to the GDR and Switzerland in 1980 and 1981.

The precise effects of the trade in this species cannot be fully assessed due to lack of population data. It seems unlikely that the total reported trade could cause significant long-term depletion of the species, or of many local populations. However, the recent rise in exports reported from Tanzania is of potential concern, partially because such exports are theoretically prohibited and partially because they may be a response to the EEC prohibition on import of European tortoises (q.v.) imposed in 1984. To a lesser extent, exports from Kenya also appear to have risen in 1984 and 1985.

CONSERVATION MEASURES Unless otherwise stated, all information on legal protection status is from *African Wildlife Laws* by IUCN Environmental Law Centre. There is no information on protection in other countries within the range, namely Angola, Botswana, Malawi, Sudan, Uganda and Zambia.

Ethiopia *G. pardalis* is totally protected under the Wildlife Conservation Regulations, 19 January 1972. It may only be hunted for scientific purposes.

Kenya In 1981, Kenya prohibited the export of *G. pardalis* without the written permission of the Minister for the Environment and Natural Resources (Legal Notice 152; 25 September, 1981). Occurs in Tsavo East, Tsavo West, Meru and Nairobi National Parks (A. Mackay, *in litt.*, 26 March 1986).

Lesotho All tortoises are protected under Proclamation of Monuments, Relics, Fauna and Flora, L.N. 36 of 1969. There is said to be no trade in any wild fauna in Lesotho (Ministry of Agriculture and Marketing, Lesotho, *in litt.*, 1985).

Mozambique The species is not protected in Mozambique (Mozambique CITES MA, 1986).

Namibia Protected by the Nature Conservation Ordinance. Occurs in all Nature Conservation areas (Department of Agriculture and Nature Conservation, Namibia, *in litt.*, 1987).

Somalia The hunting of all wildlife is prohibited in Somalia under a ban enacted on 13 October 1977.

South Africa Fully protected in Natal under Nature Conservation Ordinance, No. 15 of 1974, Proc. 164/1974. Also protected in Transvaal, Cape Province and the Orange Free State. Occurs in several protected areas (South Africa CITES MA, 1987).

Tanzania *G. pardalis* is totally protected under Wildlife Conservation (National Game) Order, 1974.

Zimbabwe *G. pardalis* is not specially protected.

CAPTIVE BREEDING Honegger (1980) reported that this species breeds readily in captivity. Loveridge and Williams (1957) described the breeding behaviour of several captive specimens of *G. p. babcocki*. Leakey (in Loveridge and Williams, 1957) reported that mating was a common occurrence among captive tortoises of this subspecies. There has been extensive captive breeding in

South Africa, one person having bred over 200. Up to 1981, there were 1985 in captivity in Transvaal alone; permit records showed that there were at least 1500 in captivity in the Cape Province in 1987 (South Africa CITES MA, 1987). Commonly breeds in semi-captivity in gardens in Windhoek, Namibia (Department of Agriculture and Nature Conservation, Namibia, *in litt.*, 1987).

A recent inventory by Slavens (1985) reported that *G. p. babcocki* is maintained in 9 localities and *G. pardalis* ssp. in a further 19 collections. A total of 80 specimens was maintained in these localities but total numbers in captivity may be higher. Several members of the California Turtle Club have bred this species in large numbers (P.H.C. Pritchard, *in litt.*, 29 December 1987).

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PANCAKE TORTOISE

Recommended list: 3*
[No problem]

Malacochersus tornieri (Siebenrock, 1903)

Order TESTUDINES

Family TESTUDINAE

*See last sentence of Summary and Conclusions

SUMMARY AND CONCLUSIONS A small, terrestrial tortoise, inhabiting scattered rocky areas in southern Kenya and north and east Tanzania. Reported to be declining in number, no precise estimates are available. Present populations are in areas with fairly dense human populations. Occurs in the Ruaha National Park, Tanzania. This species is maintained in captivity and apparently breeds readily. Listed as 'Insufficiently Known' in the IUCN Amphibia-Reptilia Red Data Book.

Until 1981, Kenya exported virtually all animals in trade, F.R. Germany and the USA taking most of these. From 1982 to 1984, only 1 captive specimen was reported in trade, but the USA reported importing 65 specimens from Tanzania in 1985. There is further evidence of continuing and possibly increasing exports from Tanzania in 1987. Kenyan legislation appears to have effectively controlled the trade. Although the species is also protected in Tanzania, and so the recent exports appear to have been illegal.

The reported trade cannot be said to pose a problem to the species; however there may be increasing trade from Tanzania. The suggested 'C3' listing rests upon the continuation of Kenya's export ban, and the absence of a substantial illegal trade from Tanzania.

DISTRIBUTION Confined to Kenya and Tanzania.

Kenya Present in isolated localities in southern Kenya, south of a line joining Njoro in the west and Malindi on the coast (Loveridge and Williams, 1957) although R. Wood (pers. comm. to P.C.H. Pritchard) reported a specimen from 29 km west of Isiolo in the Samburu district, and pointed out that the distribution was much wider than had previously been realised (see Pritchard, 1987). Recent available reports are from the Kitui District (Kenya). There is some doubt over the veracity of Loveridge's reports of the species from Njoro and Mida Creek (A.D. Mackay, *in litt.*, 26 March 1986).

Tanzania Found in north and east Tanzania (from Lake Victoria to Lindi near the Mozambique border (Loveridge and Williams, 1957). Recent available reports are from the Dodoma District and the Ruaha National Park (Tanzania). There is some doubt over the veracity of Loveridge's reports of the species from Njoro and Mida Creek (A.D. Mackay, *in litt.*, 26 March 1986).

POPULATION No precise estimates available, but reported to be declining (C.E. Norris, *in litt.*, 31 January 1981) and threatened in some degree (Honneger, 1979).

Kenya Reported by local informants to be still fairly abundant in Kitui District (A.D. Mackay, *in litt.*, 26 February 1981), where a healthy population exists in the gneissic inselbergs around Mwingi (A.D. Mackay, *in litt.*, 26 March 1986). R. Wood (see Pritchard, 1987) reported that they were "not really rare" and that a helathy population existed in an area where tortoises had previously been heavily collected.

Tanzania Said to be quite frequently encountered in Ruaha National Park, Tanzania (K. Howell, *in litt.*, 1 January 1984). Eleven individuals were once found under one rock; so density may be locally high (Loveridge, 1923).

HABITAT AND ECOLOGY A small (around 160-180 mm carapace length) terrestrial tortoise, inhabiting rocky hills (kopjes) and outcrops in arid thornbush or savanna, from 30 m to 1800 m altitude. The species may aestivate in hot weather and apparently remains in shelter during the day (Loveridge and Williams, 1957). In the wild, dry grass has been recorded as a food item and probably a variety of vegetation is consumed. Mating occurs in January and February and nesting in July or August. The clutch comprises a single egg (c 47 x 28 mm), one or two clutches may be laid per year (Pritchard, 1979).

THREATS TO SURVIVAL Exploitation for the pet trade has been the chief threat, but Wood reported (see Pritchard, 1987) that this had virtually ceased in Kenya, and considered that the clearance of thorn scrub for agricultural purposes was now the most serious threat. The presently known populations are in areas with fairly dense human populations and are particularly vulnerable (A.D. Mackay, *in litt.*, 26 February 1981).

INTERNATIONAL TRADE The Pancake Tortoise has been moderately exploited for the pet trade (Groombridge, 1982; Honegger, 1979; Norris, 1980). The only available data on international trade in this species are those contained in the Annual Reports of the Parties to CITES which are summarized below.

Table 1 Minimum net imports of live *Malacochersus tornieri* reported to CITES. All figures represent live wild specimens except when marked with an asterisk when captive bred.

	1980	1981	1982	1983	1984	1985
German D.R.	10	2	-	-	-	-
Germany, F.R.	123	212	-	-	-	-
Japan	-	6	-	-	-	-
Switzerland	9	19	-	-	-	-
UK	-	30	-	-	-	-
USA	59	318	-	1*	-	65
Total	201	587	0	1	0	65

Table 2 Reported countries of origin (or exporting country if no original source reported) and quantities of transactions of live *Malacochersus tornieri* reported to CITES. * captive-bred.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having populations of *M. tornieri*						
Kenya	196	567	-	-	-	-
Tanzania	-	-	-	-	-	65
Countries without populations of *M. tornieri*						
Germany, F.R.	-		-	1*	-	-
Country unknown	5	20	-	-	-	-

Malacochersus tornieri

International trade in this species principally occurred in 1980-1981. The only other transaction in wild animals occurred in 1985.

Kenya exported 97% of the known exports; the USA and F.R. Germany were the principal importers. Since Kenya prohibited export in 1981, there have been no reports of tortoises originating in Kenya. Pritchard (*in litt.*, 29 December 1987) reported substantial exports from Tanzania in 1987, one exporter alone having 300 ready for export. He noted many in stock at pet wholesalers in Florida, USA, but considered that the market might be saturated, as the price per animal had fallen from US$300 to US$40 (Pritchard, 1987). There were indications in 1987 that the trade in Europe might be increasing D. Morgan, pers. comm.) and this may be in response to the ban on trade in European species.

CONSERVATION MEASURES Listed as 'Insufficiently Known' in the IUCN Red Data Book (Groombridge, 1982).

Kenya In 1981, Kenya prohibited the export of *M. tornieri* without the written permission of the Minister for the Environment and Natural Resources (Legal Notice 152; 25 September, 1981).

Tanzania The Pancake Tortoise is totally protected under Wildlife Conservation (National Game) Order, 1974. It occurs within the Ruaha National Park, Tanzania (K. Howell, *in litt.*, 1 January 1984).

CAPTIVE BREEDING Numerous individuals occur in zoos and private collections (Honegger, 1979). In a recent inventory, Slavens (1985) listed 9 collections containing 26 specimens. Total numbers in captivity are likely to be higher. The species has been bred in captivity (Shaw, 1970), and breeding potential is good under suitable conditions (Honegger, 1979). Breeding may take place at any time of the year in captivity. Captive animals accept a wide variety of fruits and vegetables.

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SPUR-THIGHED TORTOISE

Recommended list: 2
[Possible problem]

Testudo graeca (Linnaeus, 1758)

Order TESTUDINES

Family TESTUDINIDAE

SUMMARY AND CONCLUSIONS A medium size terrestrial tortoise. Present in a variety of habitats including open woodland, scrub, heath, dunes and semi-desert. Widespread in countries bordering the Mediterranean and in the Middle East. Recorded from: Algeria, Bulgaria, Egypt, Greece, Iran, Iraq, Israel, Jordan, Lebanon, Libya, Morocco, Romania, Spain, Syria, Tunisia, Turkey, USSR, Yugoslavia. Introduced to Cyprus, France and Italy. Populations in North Africa depleted in areas of heavy commercial collecting, also threatened by habital destruction. Depleted in Spain. The nominate subspecies is classified as Vulnerable in the IUCN Amphibia-Reptilia Red Data Book.

Legally protected in several countries. Import into the EEC region prohibited since 1984. This appears to have resulted in the virtual cessation of *T. graeca* trade reported to CITES, with numbers falling from an annual mean of 63 033 in 1980-1983 to 321 in 1985.

There seems little doubt that populations could not sustain the level of exploitation existing previously. If trade has indeed fallen to levels recorded by CITES, it can no longer be considered a problem; however, the apparent decline should be substantiated, and trade with non-EEC countries should be monitored to ensure that it does not show a compensatory increase.

DISTRIBUTION Widespread in countries bordering the Mediterranean and in the Middle East. Recorded from: Algeria, Bulgaria, Egypt, Greece, Iran, Iraq, Israel, Jordan, Lebanon, Libya, Morocco, Romania, Spain, Syria, Tunisia, Turkey, USSR, Yugoslavia. Introduced to Cyprus, France and Italy. Not present on Malta (Ministry of Agriculture and Fisheries, *in litt.*, 1985).
Testudo graeca is so named because the appearance of the carapace scales reminded Linnaeus of a Greek mosaic, it is not the typical and widespread tortoise in Greece; the subspecies *T. g. ibera* is named after Iberia in Transcaucasia and not the Iberian Peninsula (Pritchard, 1979).

Four sub-species are generally recognised (Wermuth and Mertens, 1977), although the race from the Western Transcaucasus (USSR) has recently been described as a fifth (Khikvadze and Tuniev, 1986).

Testudo graeca graeca: Native to North Africa and Spain; introduced to Italy and France.

Algeria Confined to the north of the country (Loveridge and Williams, 1957; Lambert, 1983).

Egypt A single specimen is recorded from El Daba, north-west of El Alamein (Lambert, 1983).

France Introduced along the south coast (G.H. Parent, *in litt.*, 1980; J.P. Rische, pers. comm., 1980).

Italy Introduced into peninsular Italy, Sicily and probably Sardinia (Bruno and Maugeri, 1977).

Libya Extending eastwards to Cyrenaica (Lambert, 1983) including Kouf National Park, where it intergrades with *T. g. terrestris* (Schleich, 1984).

Testudo graeca

Morocco Widespread below 1900 m, but absent from the southern part of the Moroccan Atlantic plateau and from the arid areas in the south and south-east (Lambert, 1983).

Spain Occurs in isolated colonies in southern Spain (Murcia-Almeria, Coto de Donana Reserve and possibly the la Mancia-New Castille Region), south-west Mallorca and possibly the Pityusen Islands (Ibiza and Formentera) (Lopez Jurado *et al.*, 1979).

Tunisia Found in the north (Loveridge and Williams, 1957; Lambert, 1983).

T. g. ibera: From northern Greece, thgrough Asia Minor to western Iran.

Albania Listed as present (CITES, 1980), but no records have been located.

Bulgaria Widespread south-east of a line from Zemen to Novgrad (Honegger, 1981; Beshkov, 1984).

Cyprus Isolated specimens have been recorded, but it is doubtful that they are indigenous (Demetropoulos and Hadjichristophorou, 1981).

Greece Found in parts of north-eastern Greece, Samothrace, Samos, and certain other islands (with a questionable record from Euboea) (Gruber, 1982),

Iran Confined to the west of the country (Anderson, 1979; Lambert, 1980).

Iraq Found in the north (Mahdi and Georg, 1969; Anderson, 1979).

Romania Occurs in the coastal range to the east of the Danube (Fuhn and Vaneca, 1961).

Syria Anderson (1979) maps the distribution as passing just outside the north-eastern border, but Lambert (1980) claimed that this subspecies had been recorded from Syria.

Turkey Widespread, but absent from the Black Sea Coast to the north of the Pontic Alps (Basgolu and Baran, 1977; Lambert, 1980). Meets with *T. g. terrestris* in the south-east (Anderson, 1979).

USSR Occurs in the eastern Caucasus on the Caspian coast (Bannikov *et al.*, 1977; Lambert, 1980). The race from the Western Transcaucasus has recently been described as *T.g. nikolskii* (Khikvadze and Tuniev, 1986).

Yugoslavia Apparently confined to the mountains in southern Macedonia, although there may be an introduced population in the north (Iverson, 1986).

T. g. terrestris: Around the eastern Mediterranean, from southern Turkey to Egypt.

Egypt Confined to the north of the country from the Libyan border to Sinai (Wermuth and Mertens, 1977, Schleich, 1984).

Israel Found almost throughout the northern half of the country in cultivated as well as natural areas (Israel CITES MA, 1987; Mendelssohn, 1983).

Jordan Restricted to the Upper Jordan valley and Mediterranean habitats (Jordan CITES MA, 1986).

Lebanon Wermuth and Mertens (1977) indicate that the range of this subspecies would include Lebanon, but no records have been located. Lambert (1980) claimed that *T. g. ibera* had been recorded from Lebanon, but it seems that there may have been confusion over the subspecies.

Libya Schleich (1984) confirmed that *T. g. terrestris* occurs in the Kouf National Park, in the north-east of Libya, together with *T. g. graeca*.

Syria Anderson (1979) indicates that this subspecies occurs in the north and east of Syria.

Turkey Confined to the south-east of Anatolia (Wermuth and Mertens, 1977; Anderson, 1979).

T. g. zarudnyi: found only in eastern-central Iran, on the Central Plateau. Although it occurs close to the border, there are no records from Pakistan (Anderson, 1979).

POPULATION Said to be severely depleted in some western parts of the range, most notably in Morocco, also parts of Algeria. No details are available for the greater part of the species's range.

Algeria In the last century, tortoises were reported to be extremely common in northern Algeria. Tortoises have been collected in the Oran region for export to France as pets since the end of the last century (Lambert, 1980; J.P. Rische, pers. comm., 1980). In a 10-hour search in the Oran region one recent worker reported finding only one individual (Lambert, 1980). Elsewhere the species would appear to be relatively abundant. In some regions, tortoises are reported to be found at sighting frequencies of 4 to 10 per hour (Anon., 1981). Still found in reasonable numbers in the Algiers region, despite well developed agriculture (Lambert, 1980).

Bulgaria Formerly widespread, but now depleted in places, particularly the lowlands (Beshkov, 1984). Tortoises had virtually been eliminated from the south-west of the country in the 1960s but populations have since recovered slightly (T. Belokapova, *in litt.*, 20 April 1987).

Cyprus Only isolated specimens have been recorded (Demetropoulos and Hadjichristophorou, 1981).

France Introduced. Population status uncertain, not clear if regular breeding occurs (G.H. Parent, *in litt.*, 1980; J.P. Rische, pers. comm., 1980).

Greece Population status in general appears satisfactory, although the species is potentially threatened by collecting (Gruber, 1982).

Israel No surveys have been made but *T. graeca* populations are said to be healthy and substantial and there is no indication that they are declining (Israel CITES MA, 1987).

Italy Introduced to peninsular Italy, Sicily, probably also into Sardinia (Bruno and Maugeri, 1977). Uncertain if regular breeding occurs in all localities. Precise status unknown, considered rare (M. Capula, *in litt.*, 1980) and threatened (S. Bruno, *in litt.*, 1980; M.G. Di Palma, *in litt.*, 1980). A study conducted in April 1986 classified them as vulnerable (Italy CITES MA, 1987).

Jordan The total population is estimated at 10 000–15 000 (Jordan CITES MA, 1986).

Testudo graeca

Morocco Traditionally supplied most specimens for the pet trade in Europe until 1978 when Morocco ratified CITES and banned the export of all wild animals including tortoises. At its peak the trade exported several hundred thousand tortoises annually. Populations now severely depleted. In heavily collected areas tortoises are now scarce: one worker recorded an average sighting frequency of 0.41 per man-hour in June 1978 (Lambert, 1980). Comparisons between west Turkey and Morocco suggest that collection over the last 80 years could have reduced abundance by as much as 90% in some areas (Lambert, 1980).

Spain Populations exist at low densities and have disappeared from many areas of the peninsula (Andrada, 1980). The western population in the Donana National Park is said to be secure, but populations to the east, in the provinces of Almeria and Murcia, are much sparser (Spain CITES MA, 1987). Despite reports of the species's presence on the Pityusen Islands (Ibiza and Formentera), populations do not appear to exist at present, or at least are represented by very few individuals, possibly escaped animals (Lopez Jurado *et al.*, 1979).

Tunisia In the nineteenth century tortoises were reported to be common on the Tunisian plains. In the past small numbers have been exported to Italy (Lambert, 1980). It is said to be common throughout the coastal zone and in the central plains (Tunisia CITES MA, 1987).

No information is available for remaining countries within the range: Egypt, Iran, Iraq, Israel, Lebanon, Libya, Romania, Syria, Turkey, Yugoslavia.

HABITAT AND ECOLOGY A medium sized terrestrial species, large individuals reaching more than 25 cm in length. Found in a variety of habitats, including sparsely vegetated coastal heathlands, sand dunes, semi-desert areas, and Mediterranean woodlands, often with Cork Oak *Quercus suber* and Ilex *Q. ilex*. Ranges up to 1900 m in Morocco. Mainly herbivorous. The species hibernates during the winter but may emerge temporarily during warm days. Emerges finally as early as February in hot coastal areas. Mating occurs in the spring and eggs are usually laid in May and June (reported to be June and July in Israel). Clutch size ranges from 2-5, egg size approximately 3 x 4 cm. Although survival is possible in the higher latitudes of north-west Europe, the success of reproduction is limited by insolation generally being insufficient for incubation and hatchling survival (Lambert, 1983; Pritchard, 1979).

THREATS TO SURVIVAL The main threats to this species are habitat destruction and bulk trade collection. Habitat destruction is particularly significant in the Mediterranean coastal belt where large scale tourist development is occurring. Agricultural habitat modification also influences reproductive success (Lambert, 1981). Large-scale collection for the pet trade has resulted in populations in northwest Africa being severely depleted; numbers may have been reduced by as much as 90% in some areas. Selective size collection both to meet voluntary agreements in the U.K. and to maximize profits has had an effect on the size and weight of tortoises remaining in the wild. In general, tortoises in areas of heavy collection tend to be smaller and lighter. Females tend to be larger than males and selective collection of the middle size range may have resulted in small males being left to mate with especially large females. This may affect reproductive success (Lambert, 1980, 1981). Following Morocco's ban on tortoise exports the bulk of this trade has switched to Turkey (Anon., 1981). Studies in Germany suggest that after arrival in northern Europe more than 80% of imported tortoises die in the first year. This is mainly due to stress caused by transportation, poor conditions in pet shops, and disease and parasite attacks encouraged by unsuitable climate (Anon., 1981; Lambert, 1980). A further threat may be

posed by the desertification of the range; the northward extention of the Sahara has resulted in retraction of *T. graeca* distribution in Libya (Lambert, 1981). Not collected or persecuted in Jordan, where an encounter with a tortoise is believed to bring good luck (Jordan CITES MA, 1986). There is not thought to be any trade in tortoises in Israel, although they are occasionally kept as pets when they have been found in gardens or fields. This is not thought to pose a significant threat (Israel CITES MA, 1987). Illegal commercial collection of tortoises is thought to be a problem in Bulgaria, as well as locals and tourists who collect them for pets (T. Belokapova, *in litt.*, 20 April 1987).

INTERNATIONAL TRADE There is good evidence that large-scale collecting for the pet trade, for long centred in Morocco and Algeria, has resulted in severe depletion of tortoise populations. Although most animals have remained in Europe, significant numbers have been re-exported to Japan and the USA, mainly by F.R. Germany and the UK. No data are available on the effects of collecting in Turkey, which assumed greater importance after Morocco's 1978 export ban, but in view of the very large numbers involved, local depletions are likely to have occurred there also. Although reporting is not comprehensive, available CITES figures for 1984 indicate an almost complete cessation of trade in *Testudo graeca* into the EEC, although there were substantial imports to Austria. By 1985, the only significant trade was to the USA, the Austrian trade having ceased. The import ban imposed in the EEC in 1984 appears to have been highly effective in halting trade, one result of which was a very dramatic increase in the retail price of tortoises in the UK (Luxmoore and Joseph, 1986). There can be little doubt that populations of this species cannot sustain trade on the scale occurring in the 1970s and early 1980s.

Table 1. Apparent minimum net imports of live *Testudo graeca* reported to CITES. Virtually all reported imports are commercial not private.

	1980	1981	1982	1983	1984	1985
Argentina	–	–	–	–	4	–
Austria	–	–	2985	10800	11000	–
Belgium	–	7000	–	–	–	–
Brazil	–	–	–	–	–	2
Denmark	–	–	–	–	8	–
France	100	–	–	–	–	–
German D.R.	–	–	–	–	–	10
Germany, F.R.	41985	48302	–	3	–	–
Italy	–	8*	–	–	–	–
Japan	43	12	–	–	–	–
Netherlands	–	–	–	1	–	3
Spain	–	–	–	–	–	7
Sweden	50	–	–	–	–	–
Switzerland	1658	3530	2021	50	1	–
UAE	–	–	–	500	–	–
UK	39946	38625	22240	27935	–	–
USA	352	1449	275	2265	1	299
*inc. 4 captive bred						
TOTAL	84134	98926	27523	41550	11014	321

Testudo graeca

Table 2. Reported countries of origin (or exporting country if no original source reported) and quantities of transactions in live *T. graeca* reported to CITES.

	1980	1981	1982	1983	1984	1985
a. Countries with wild populations.						
Greece	-	61	2	-	-	3
Italy	50	-	-	-	-	-
Morocco	20	-	-	-	-	-
Spain	45	-	-	-	-	-
Turkey	55003	89115	24520	35000	-	301
Yugoslavia	28990	9742	3000	6550	11000	-
b. Countries without wild populations.						
Hungary	-	-	-	-	1	-
Switzerland	-	4	-	-	-	-
United Kingdom	-	-	-	-	8*	3
USSR	-	-	-	-	4*	3*
*captive bred						
Country Unknown	18	-	-	12	1	13

CONSERVATION MEASURES With effect from 1 January 1984 the import of *Testudo graeca* and *T. hermanni* into the EEC region is prohibited.

Listed on Appendix II of the Convention of European Wildlife and Natural Habitats, Bern 1979 (Honegger, 1981). This obliges contracting parties to take appropriate legislative and administrative measures to ensure strict protection of the species.

Algeria *T. graeca* is listed as a protected species under Decret No. 83.509, 20 August 1983 (Algeria CITES MA, 1987).

Bulgaria Collection and killing of tortoises is prohibited by Order No. 128 of 1981 (Beshkov, 1984). A further Order, No. 729, was issued in 1986 which made all forms of collection illegal. A poster on tortoise protection was distributed in 1986, and the police conducted road checks to look for illegal tortoise dealers. Further distribution of posters and television coverage of the problem were planned for 1987 (T. Belokapova, *in litt.*, 20 April 1987).

Israel *T. graeca* is banned from all trade in Israel. It has also been designated a "protected asset of nature" and, as such, may not be harmed (Israel CITES MA, 1987).

Italy *T. graeca* is not legally protected in Italy, although it occurs within some protected areas (Italy CITES MA, 1987).

Morocco After ratifying CITES in 1978 Morocco banned the export of all wild animals, including tortoises (Anon., 1981).

Romania Legally protected, and declared a national monument. Occurs in several reserves (Honegger, 1981).

Spain Legally protected under Decreto 2573 of 5 October, 1973; occurs in the Coto de Donana reserve in Spain; listed as Vulnerable in the Spanish Red Data Book (Spain CITES MA, 1987).

Tunisia *T. graeca* has been protected since 1974, and its export has been forbidden (Tunisia CITES MA, 1987).

CAPTIVE BREEDING Large numbers of this species are kept as pets. Regular breeding in captivity is possible, given appropriate care and conditions (Kirsche, 1980). It has been suggested that captive-bred tortoises should replace wild-caught specimens in the live animal trade (Kirsche, 1980).

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HERMANN'S TORTOISE

Recommended list: 2
[Possible problem]

Testudo hermanni (Gmelin, 1789)

Order TESTUDINES

Family TESTUDINIDAE

SUMMARY AND CONCLUSIONS A small terrestrial tortoise, restricted to southern Europe. The range extends around the Mediterranean, often in coastal areas, from north-east Spain eastward to European Turkey; the species also occurs in parts of Romania and Bulgaria and is present on several islands. Inhabits a variety of rather dry habitats (scrub woodland, heath or *maquis*, for example), in areas with hot summers, often at coastal sites. Mainly herbivorous. Clutch comprises 1-12 eggs, often around three, there may be two clutches per season. Western populations from Spain to Italy (*T. h. robertmertensi*) are in general extremely localized and depleted; eastern populations (*T. h. hermanni*) are more widespread and sometimes with adequate numbers, but heavily exploited for the pet trade in many areas and declining in parts. Listed as Vulnerable in the IUCN Amphibia-Reptilia Red Data Book, Part 1.

Import into EEC countries has been prohibited since 1984. Numbers in reported trade fell significantly, from an annual mean of 16 787 in 1980-1983, to 7371 in 1984, but then rose again to 13 349 in 1985. Most of the imports in 1984 and 1985 were to Austria, Switzerland, Hungary and the USA (not EEC members). Turkey was formerly the major source, but recently Yugoslavia has emerged as the main supplier. In 1985, 4000 were reported as originating in the USSR, possibly indicating misidentification for *T. horsfieldii*. Listed on Appendix II of the Convention on the Conservation of European Wildlife and Natural Habitats. Nominally protected by legislation in much of the range, present in a few protected areas.

There seems little doubt that populations were adversely affected by the level of exploitation existing prior to 1984. If imports to the EEC since the import ban have in fact fallen to the level reported to CITES, it is unlikely to pose a serious problem; but the growing imports to non-EEC countries, particularly Austria, is of concern. Imports from the USSR should be investigated.

DISTRIBUTION Restricted to southern Europe. Present in Albania, Bulgaria, France, Greece, Italy, Romania, Spain, Turkey and Yugoslavia. Although reported to occur on Malta (see Iverson, 1986), any individuals of *T. hermanni* found may be escapes, it is occasionally imported by pet shops but does not live or breed in the wild (Ministry of Agriculture and Fisheries, *in litt.*, 1985).

This species is usually (Wermuth and Mertens, 1977) treated as comprising two subspecies; *T. h. robertmertensi* from central Italy, Sardinia and Corsica westwards, and *T. h. hermanni* from southern Italy and the Balkans. However, some doubt has been raised about the proper assignment of animals from peninsular Italy (Bruno and Maugeri, 1977). Bour (1987) has proposed that what Wermuth and Mertens (1977) treated as *T. h. robertmertensi* should be called *T. h. hermanni* and that what they treated as *T. h. hermanni* should be assigned to *T. h. boettgeri*.

Albania Few details available (see Iverson, 1986), probably widespread.

Bulgaria Formerly widespread, although now absent from several parts of its former range (Beshkov, 1984).

Testudo hermanni

France Localized, occuring in the Albères hills along the French-Spanish border in the east Pyrenees, and the Maures and Estérel mountains in Var province (south-east France) (Cheylan, 1981; Devaux *et al.*, 1986). Also present (though probably introduced) on Corsica, mainly along the east coast (Honegger, 1981).

Greece The most widespread tortoise in Greece where it appears to occur over much of the mainland including the Peloponnese (Arnold and Burton, 1978). It may be absent from parts of the south-east, around Corinth, and becomes progressively rarer east of Thessaloniki (Stubbs *et al.*, 1981). Present on the Ionian Islands, including Corfu (Honegger, 1981).

Italy Hermann's Tortoise is present in peninsular Italy, mainly on the Ligurian and Tyrrhenian coasts and also occurs on Sicily, Sardinia, and certain smaller islands including Elba, Lampedusa and Pantelleria (Bruno and Maugeri, 1977).

Romania Recorded from about 40 localities in the counties Mechedinti, Caras-Severin and Gorj; all near the Yugoslavian border in the extreme south-west (Fuhn, 1981; Fuhn and Vancea, 1961).

Spain Present in small numbers in the south of Menorca and two populations in north-east and south-east Mallorca (Balearic Islands), also on the mainland, in a small area in the north of Gerona province (Lopez Jurado *et al.*, 1979; Cheylan, 1981). Also reported from the area of Valencia (Andrada, 1980), with scattered reports from elsewhere. There is a possibility that most *T. hermanni* colonies on the mainland are not indigenous (Lopez Jurado *et al.*, 1979).

Turkey Restricted to European Turkey (Basoglu and Baran, 1977; Eiselt and Spitzenberger, 1967; Pritchard, 1979).

Yugoslavia The species ranges along the Adriatic coast from Dalmatia southwards, then south-east through parts of Macedonia (Meek and Inskeep, 1982; Meek, 1985).

POPULATION

Albania No data.

Bulgaria Formerly widespread (Beskov and Beron, 1964), but numbers of both *Testudo* in Bulgaria have declined sharply over the last decades; both are now absent from several parts of the country (Beskov, 1984).

France During Neolithic times *T. h. robertmertensi* ranged across the entire Mediterranean region of mainland France, and also much further to the north (Cheylan, 1978). The species has since undergone a severe regression, due apparently to climatic and human influences, and is now restricted to hills in the province of Var in the extreme south-east (the Massifs des Maures and Estérel), and the Albéres in the east Pyrenees. The tortoise is now regarded as severely threatened in France (Cheylan, 1978, 1981). Extirpated in the early 19th century in Iles d'Hyéres owing to over-exploitation (Rische, 1979). Although the general area of distribution may not have diminished greatly for several decades, the density of individuals is progressively decreasing (Dumont, 1974). Small populations remain in parts of the Massif des Maures, but at densities as low as 3-4 per ha, where they are regarded as under severe threat (Devaux *et al.*, 1986). Populations may be locally adequate in Corsica (J.-P. Rische, pers. comm., 1980). However, available evidence indicates that the Massif des Maures population is slowly declining due to egg predation and changes in land use (Stubbs and Swingland, 1985).

Greece Populations are widespread and still generally in satisfactory condition, although an overall decline has been observed (Gruber, 1982). In the north-east, the species becomes progressively rarer east of Thessaloniki (Stubbs *et al*, 1981). At a major 75-ha study site on coastal heath at Alyki (Macedonia), average *T. hermanni* density was 55 per ha, with a total population of around 5,000. In optimum dry sandy heath habitat within this site, a maximum density of over 150 tortoises per hectare was observed (Stubbs *et al.*, 1981). After a severe fire swept the area in 1980 the population was estimated to have fallen to 25 per ha in 1982 (Stubbs *et al.*, 1985).

Italy In general, rare and localized (Bruno and Maugeri, 1977); has disappeared from much of the coast, but probably retains natural densities in some National Parks (eg. Maremma) or on private land (Bruno, 1971, 1973).

Romania Reportedly in marked decline (Honegger, 1981).

Spain Both *Testudo* species in mainland Spain are reported to exist in low density and to have disappeared from many areas (Andrada, 1980). In the Balearics, populations are extremely localized in the south of Menorca and local in Mallorca (Lopez Jurado *et al.*, 1979). Fire is said to be an important factor causing a population decline in Gerona (Spain CITES MA, 1987).

Turkey Apparently not common within its restricted range, but no details available.

Yugoslavia Declining locally due to collecting for the pet trade (Honegger, 1981). Healthy populations are known in parts of Dalmatia and Montenegro (Meek and Inskeep, 1982; Windolf, 1980). Around 125 individuals were noted in a 2 km^2 area in Montenegro (Meek and Inskeep, 1982). A further study, in 1983, estimated a mean density of 39.2 per ha (Meek, 1985).

HABITAT AND ECOLOGY A small terrestrial tortoise, to around 20 cm length, individuals in western populations may be a little smaller. Inhabits a variety of often rather dry habitats, in areas with hot summers. Generally in lowlands and low hills, and in open deciduous woodland, wood edges, scrub fields and hillsides, *maquis* and *garrigue* vegetation, etc. (Arnold and Burton, 1978; Meek, 1985; Windolf, 1980; Bruno and Maugeri, 1977). At one study site in northern Greece, maximal tortoise density was found in areas of dry sandy heath with a ground cover of lichens and herbs, *Artemesia* clumps, Hawthorn and *Ruscus aculeatus* (Stubbs *et al.*, 1981).

Mainly herbivorous, although invertebrates, carrion and faeces may be eaten on occasion. At one scrubland site in southern Yugoslavia (Meek and Inskeep, 1982) leguminous plants of the subfamily Papilionoidea provided the bulk of the diet.

Sexual maturity may be attained (in females) at around seven years. There is typically a period of winter hibernation, courtship may occur sporadically throughout the summer. Eggs are generally laid in May-June, with the hatchlings emerging in August-September. A flask-shaped nest 7-8 cm deep is excavated by the hind feet. The clutch comprises from one to 12 eggs, usually three. Eggs are hard-shelled, slightly elongate. There may be two clutches laid per season (Pritchard, 1979; Street, 1979).

THREATS TO SURVIVAL Threatened mainly by large-scale commercial collecting and habitat destruction. Western populations assigned to *T. h. robertmertensi*, particularly those in mainland France, are at risk due to the extremely localized distribution. About 103 450 ha of maquis and pine woods have been destroyed by fire in Var (France) in the last ten years, and 20% of the French *hermanni* population may have been destroyed in the fire of July

1979 (Dumont, 1974). In northern Greece, Stubbs *et al.* (1985) estimated that a heath fire reduced the population by about 40%, but they found that the growth rate of juveniles rose sharply subsequently, and they concluded that tortoise populations were relatively resiliant to this type of catastrophe. In France, tortoises are occasionally collected for commercial purposes, but the collection of individual animals as pets is also a serious problem owing to the low population numbers (Devaux *et al.*, 1986). Urbanization is a further threat (Cheylan, 1981). Habitat alteration is cited as the primary cause of decline in Bulgaria, including intensification of agriculture, expansion of pasture-land, and coniferous afforestation, but with industrialisation, urbanisation and collecting for food as secondary causes. Collecting now occurs mainly around Plovdiv and vicinity, but was concentrated in the east where *T. hermanni* used to be abundant, and shifted to the west in the 1970s (Beshkov, 1984). On the Tyrrhenian coast of Italy, transformation of the coastal environment by building speculation, collecting for the pet trade, and use as food by local inhabitants, are cited as major threats (Chelazzi, *in litt.*, 1980). Populations in Yugoslavia have been subjected to extremely heavy collection pressure; as many as 40 000 animals were exported for the pet trade in the early 1970s (Honegger, 1981). The tortoises are eaten by man in some parts of the range, eg. Bulgaria (Sura, 1981) and are widely offered as tourist souvenirs, in Yugoslavia, for example.

Table 1. Apparent minimum net imports of live *Testudo hermanni* reported to CITES (eight preserved specimens were also reported but do not appear below).

	1980	1981	1982	1983	1984	1985
Australia	–	–	–	–	–	2
Austria	–	–	–	5350	3355	85
Bermuda	–	–	–	8	–	–
Canada	–	–	–	7	–	6
Chile	–	–	–	–	1	–
Denmark	–	–	–	–	8	–
France	650	499	–	400	300	–
German D.R.	1400	–	6	–	1	–
Germany, F.R.	14217	2	–	2	7	22*
Hungary	–	–	–	–	400	–
Italy	–	–	–	15	–	–
Japan	20	800	–	210	5	43
Korea (Rep.)	–	–	2*	–	–	–
New Zealand	–	3	–	–	–	–
Saudi Arabia	–	–	–	–	–	–
Spain	–	–	–	2	2	1
Switzerland	3855	4788	5277	4751	2549	2019
Tanzania	–	–	–	–	–	2
UAE	–	–	–	–	–	30
UK	9993	10000	3	2503	–	–
USA	347	71	841	1126	734	1354
Country Unknown	–	4	–	–	–	–
* captive bred						
Total	30478	16171	6129	14372	7371	13349

INTERNATIONAL TRADE Large numbers of live *T. hermanni* have been involved in the pet trade in recent decades. Austria, F.R. Germany, Switzerland and the UK have all been major importers in the 1980s, the last two countries most consistently. A majority of these specimens have remained in Europe but some have been re-exported to the USA. Turkey was formerly the major source, but recently Yugoslavia has emerged as the main supplier. In 1985, 4000 were reported as originating in the USSR, possibly indicating misidentification for *T. horsfieldii*. Since the ban on imports into the EEC in 1984, numbers in reported trade have fallen significantly, from an annual mean of 16 787 in 1980–1983 to 7371 in 1984, but then rose again to 13 349 in 1985. Most of the imports in 1984 and 1985 were to Austria, Switzerland, Hungary and the USA (not EEC members).

Table 2. Reported countries of origin (or exporting country if no original source reported) and quantities of transactions in live *T. hermanni* reported to CITES.

	1980	1981	1982	1983	1984	1985
a. Countries having wild populations of *T. hermanni*						
Bulgaria	–	–	1	–	–	–
Greece	13	1	3*	3	4	–
Italy	–	2	–	–	–	–
Turkey	24000	10350	255	2500	–	286
Yugoslavia	6131	5720	5784	11866	7358	9054
b. Countries without wild populations of *T. hermanni*						
Austria	29	68	–	–	–	–
Belgium	–	–	83	–	–	–
Czechoslovakia	2	–	–	–	–	–
German D.R.	–	–	–	–	4*	–
Germany, F.R.	303	–	–	–	2	–
Iceland	–	–	–	–	5	–
Switzerland	–	–	–	–	–	42*
UK	–	–	–	–	10*	2
USSR	–	–	–	–	2	4000
Country Unknown	–	–	5	1	4	3

*captive bred

CONSERVATION MEASURES Listed on Appendix II of the 1979 Convention on the Conservation of European Wildlife and Natural Habitats (the Berne Convention) (Anon., 1979). This obliges contracting parties to take appropriate legislative and administrative measures to ensure strict protection of the species. Import of Mediterranean *Testudo* species into the EEC has been prohibited since 1 January 1984.

Bulgaria Collection and killing of tortoises is prohibited by Order No. 128 of 1981 (Beshkov, 1984). A further Order, No. 729, was issued in 1986 which made all forms of collection illegal. A poster on tortoise protection was distributed in 1986, and the police conducted road checks to look for illegal tortoise dealers. Further distribution of posters and television coverage of the problem were planned for 1987 (T. Belokapova, *in litt.*, 20 April 1987).

France Protected by law (No. 76269, 10 July 1976, and Décret No. 77.1295,

25 November 1977). A three-year research programme has recently been completed in the Massif des Maures (Var) and a cooperative tortoise conservation project was initiated. This involves habit restoration, protection of nest sites, and captive propagation (Devaux *et al.*, 1986).

Italy *T. hermanni* is not legally protected in Italy, although it occurs within some protected areas (Italy CITES MA, 1987), including the Parco Naturale Regionale della Maremma, in coastal Tuscany (E. Balleto, pers. comm., 1981).

Romania Legally protected, and declared a national monument. Occurs in several reserves (Honegger, 1981).

Spain Legally protected under Decreto 2573 of 5 October, 1973; listed as Vulnerable in the Spanish Red Data Book (Spain CITES MA, 1987). A major population of *T. hermanni* occurs on private land in Mallorca and is the main subject of the Son Cifre Conservation Project (Kramer, 1981).

CAPTIVE BREEDING Regular breeding in captivity is possible, given appropriate care and conditions (Kirsche, 1980). It has been suggested that captive-bred tortoises should replace wild-caught specimens in the live animal trade (Kirsche, 1980). As part of a conservation programme in southern France, eggs have been collected from the wild and artificially incubated to reduce predation (Devaux *et al.*, 1986).

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AFGHAN or HORSFIELD's TORTOISE

Recommended list: 2
[Possible problem]

Testudo horsfieldii Gray, 1844

Order TESTUDINES

Family TESTUDINIDAE

SUMMARY AND CONCLUSIONS A small Central and South-west Asian tortoise, ranging from Kazakhstan (USSR) and the western fringe of the Dzungarian Basin (China) south through Afghanistan and east Iran to the Baluchistan region of Pakistan. Occurs in a variety of semi-arid habitats, including semi-desert and steppelands. Reproductive potential is low; rather late maturing, with first breeding at 11-14 years, and with two clutches per year, of only 5-6 eggs in total.

The species is affected by habitat loss due to agricultural expansion in parts of the range. Around 150 000 specimens annually have been collected in Kazakhstan alone in recent years, about half of which are sold within the USSR. Between 24 000 and 100 000 annually have been recorded in international trade from 1980 to 1985.

Despite substantial populations remaining in the USSR, this level of harvest may well be non-sustainable; management and further field research have been recommended.

DISTRIBUTION A Central and Southwest Asian species, extending from the eastern shores of the Caspian Sea eastward through the Turkestan region just into the Dzungarian Basin of China, and south-east through eastern Iran and much of Afghanistan to north-west Pakistan.

Following Khozatsky and Mlynarski (1966), some authors assign this species to the genus *Agrionemys* rather than *Testudo*; it differs most noticeably from members of the latter genus in possessing four rather than five digits on the forelimbs, also in other features.

Afghanistan Apparently occurs widely, with the exception of the Afghan portion of the Seistan basin and the complex knot of mountain ranges in the centre and north-east (Anderson, 1979, Fig. 12).

China To the east of Lake Balkhash (USSR) the species extends into the Dzungarian Basin in the Xinjiang Uygur (Sinkiang Uigur) Autonomous Region of China, where it occurs in a 120 sq. km hill area north of Huocheng County (Anon., 1984).

Iran The range extends south from Turkestan into eastern parts of the Iranian plateau, where the species is recorded from the provinces of Mazanderan (the north-east only) and Khorasan, but not south of the Seistan basin (Anderson, 1979).

Pakistan Despite its apparent absence from Iranian Baluchistan (Zarudny, cited in Anderson, 1979), the Afghan Tortoise is generally distributed in the north and west of the Baluchistan region of Pakistan and into Wazirstan in the tribal frontier areas (Minton, 1966).

USSR Widely distributed through the Turkestan region, in Turkmenistan, Uzbekistan and southern and central parts of Kazakhstan. Apparently largely absent from the Pamir and Tien Shan highlands of Tadzhikistan and Kirgizia, in the southwest of this region (Bannikov *et al.*, 1977).

POPULATION Little information is available on populations of *T. horsfieldii* in Afghanistan, China, Iran and Pakistan, but useful data are available from the Russian portion of the range.

Afghanistan Noted as numerous on the plains near Gulran in the extreme north-west of the country in 1884 (Aitchinson, 1889). Reportedly quite abundant in the Dasht-i-Leili between Maimana and Shibarghan in northern Afghanistan (Toynbee, 1961); no recent information available for most of the country.

China One source (Anon., 1984) terms the species "rare" and states that the population has been "decimated".

Iran Reports from the turn of the century (Zarudny, cited in Anderson, 1979) suggest that the species was common at (at least) one locality in eastern Khorasan, but rare in the southern part of its range; no recent information available.

Pakistan Cited as "rare" (Ghalib *et al.*, 1980), but general information presented by Minton (1966) suggests the species is not uncommon locally; for example, seven individuals were seen at one time in a meadow near a small watercourse.

USSR Quite extensive surveys have been carried out in many parts of Kazakhstan S.S.R. (Alma-Ata, Taldy-Kurgan, Dzhambul, Chimkent oblasts) (Brushko and Kubykin, 1982), and the southern parts (Maryj region) of Turkmen S.S.R. (Frolov *et al.*, 1985). Tortoise population density varied considerably over the 2130 ha surveyed in Kazakhstan, between 0.5 and (exceptionally) 26 specimens per hectare, but about seven per hectare was rated as "comparatively high" and most sites appear to have yielded between two and three per hectare (Brushko and Kubykin, 1982). A specific instance of regional decline is provided by the Kerbulak massif in Kazakhstan where at present between 11 and 15 individuals may be found per hectare, yet the same sites reportedly held about 40 per hectare in the 1950s (Brushko and Kubykin, 1982). The higher of the densities found in Kazakhstan are reportedly rare in other parts of the species' range in USSR (see Russian language sources cited in Brushko and Kubykin, 1982). This seems to be confirmed by recent data from southern Turkmenia, where the highest local mean density in the Maryj region was about 4.5 specimens per hectare (in argillaceous and sandy desert foothills), and the lowest 0.44 per hectare (in the valley of the Murghab river system) (Frolov *et al.*, 1985). Total numbers in the 45% of the 86 000 sq. km area Maryj region that was surveyed, were estimated at 26.8 million. The species is not included in the USSR national Red Data Book.

HABITAT AND ECOLOGY A rather small tortoise, males attain a maximum length of about 16.5 cm (1100 g), and females about 19.5 cm (1750 g) (Brushko and Kubykin, 1982). Various habitat types are occupied, including sand or stone deserts and mountain slopes, but tortoise density varies appreciably between them. In Kazakhstan the largest populations occur in desert areas with wormwood *Artemisia* spp. and a variety of ephemerals, but in general good populations may be found in areas of broken relief, steppe areas with good grass cover, along seasonal river beds and ravines with abundant shelter. Numbers are lowest in saline zones, and in sandy or stony deserts (Brushko and Kubykin, 1982). In Pakistan, Afghan Tortoises frequent rocky hill country, especially between 1500 and 2100 m (5000-7000 ft), and can be seen most readily at grassy sites near springs or streams. They do range into moderately arid rocky desert but appear to avoid areas with sand or clay substrates (Minton, 1966).

Testudo horsfieldii

In USSR the species is only active for 2.5-3 months, from the end of March until mid-June; the rest of the year is spent in shelter (although there may be sporadic activity in summer and autumn). Mature males both enter aestivation earlier and become active earlier than females and juveniles. Activity over a 24 hr period is similarly restricted, typically to between 10 a.m.-12 noon and 4-6 p.m., but this simple two-peak pattern is obscured in bad weather when activity is more widely distributed, and also varies according to the nutritional state of the individual. Shelters occupied are simple scrapes in the ground, to carapace depth, or burrows under rocks - apparently deeper during the winter aestivation period (Brushko and Kubykin, 1982; Minton, 1966).

The diet is largely vegetarian; adults feed on leaves, fruit and flowers (rarely on grass) while young appear especially attracted to fruit and flowers red in colour (Minton, 1966). Considerable fat reserves are accumulated during spring and feeding (Brushko and Kubykin, 1982).
Sexual maturity is attained relatively late: at 11-12 years of age, carapace length 11.2-11.7 cm, weight 380-480 g, in males, and 13-14 years, 13.4-14 cm, 560-620 g, in females (Brushko and Kubykin, 1982). Copulation (males always smaller and younger than females) occurs in March-April, egg-laying typically at the end of April and the beginning of June (although varying in females of different ages) (Brushko and Kubykin, 1982). The reproductive rate is low: in south-east Kazakhstan two clutches are laid per year, five or six eggs in total. There appears to be appreciable, although unquantified, mortality of eggs and young due to predation and climatic factors. For example, young tortoises form a considerable portion of the diet of rooks *Corvus frugilegus* in Kazakhstan (Brushko and Kubykin, 1982).

Individual movements do not appear to be extensive; for example, 32% of 132 specimens marked in 1975 were recaptured in 1976-1978 between 40 and 1220 m from the original site (Brushko and Kubykin, 1982).

THREATS TO SURVIVAL Threatened by exploitation for the live animal trade, for food, and in the USSR portion of the range at least, by habitat changes associated with agricultural development.

In China, hunting for food is cited as the major threat (Anon., 1984). Similarly, in parts of the USSR, tortoise soup is much appreciated and the liver and eggs are highly regarded. Tortoises are exported for food use and were even used as food for fur-bearers during the 1950s (Brushko and Kubykin, 1982).

Large numbers of tortoises enter the live animal trade. The number collected for this purpose in Kazakhstan has increased steeply: 43 000 in 1967, 110 000 in 1973, 126 000 in 1975 and about 150 000 annually in recent years (Brushko and Kubykin, 1982). Brushko and Kubykin (in a paper prepared in 1981) stated that large-scale exploitation for the world market has been permitted "during the last five years", ie. since about 1976. However, almost half of the animals collected are still sold within the USSR Collecting in Kazakhstan tends to take place soon after the start of aestivation, so a greater proportion of males than females are caught (they cease activity before females); they are also preferred by collectors because of their smaller size. However, it seems that collecting can lead to complete removal of tortoises from large areas; because of the restricted nature of tortoise movement the re-colonisation of such areas may take a long time or may not take place at all (Brushko and Kubykin, 1982).

Decline in the USSR is also attributed to the extension of mechanised agriculture into hitherto untouched terrain, leading to direct injury during ploughing and other operations, and to the loss of suitable habitat. In

much-modified areas, tortoises are confined to field edges and to remnants of suitable habitat. Significant juvenile mortality is caused by road traffic and fire, and (juveniles) by trampling by livestock. Tortoises are said to avoid areas with heavy pasturage of cattle and sheep (Brushko and Kubykin, 1982); on the other hand, in Pakistan tortoises are said to be oblivious to the presence of goats (Minton, 1966).

Table 1. Minimum net imports of *T. horsfieldii* reported to CITES

	1980	1981	1982	1983	1984	1985
Austria	-	-	70	-	-	-
Argentina	-	-	-	-	4	6
Belgium	5000	-	7000	10000	-	-
Bermuda	-	-	-	6	-	-
Canada	-	-	-	4	-	-
Denmark	1000	3250	5910	-	-	-
German D.R.	-	-	15000	15000	-	20000
Germany, F.R.	41146	4599	62940	29835	4	3
Hungary	-	-	-	-	-	4000
Italy	-	-	-	-	40314	-
Japan	-	-	12	50	-	-
Kuwait	-	-	200	30	-	-
Luxembourg	-	-	50	100	-	-
Netherlands	-	-	-	-	1	-
Saudi Arabia	-	-	30	270	-	-
Spain	-	5060	5300	400	-	2
Sweden	-	-	-	-	2	-
Switzerland	850	-	120	185	-	-
UK	-	1	-	6	10	-
USA	4	750	873	320	-	-
Country unknown	-	65000	65000	-	-	-
TOTAL	48000	78660	97512	56206	40335	24011

Table 2. Reported countries of origin and quantities of transactions reported to CITES.

	1980	1981	1982	1983	1984	1985
a. Countries having wild populations of *T. horsfieldii*						
Afghanistan	-	-	-	6	-	-
USSR	48000	78660	97500	56206	14	24008
b. Countries without wild populations of *T. horsfieldii*						
German D.R.	-	-	-	-	4*	-
Germany, F.R.	-	-	12	60	-	-
Turkey	-	-	-	-	40314	-
Country unknown	-	-	5	-	3	3

*captive bred

INTERNATIONAL TRADE See preceding section for an outline of collecting and trade in the USSR; virtually all *horsfieldii* in trade reportedly originate from this country. Data from this major part of the species's range suggests that populations can withstand at least a moderate level of harvest, but, in conjunction with evidence for habitat modification and the large domestic trade in the USSR, it may be suspected that levels of international trade prevailing in the early 1980s are excessive. See Conservation Measures section, below, for proposals to mitigate the effects of exploitation.

The 1984 transaction appearing in the above tables, involving 40 314 tortoises supposedly shipped from Turkey to Italy is anomalous; these animals may in fact have been of one or both the *Testudo* species occurring in Turkey (*horsfieldii* does not), or may be *horsfieldii* in transit from USSR, which otherwise had an unusually small export figure for these years.

CONSERVATION MEASURES

China Nominally protected by legislation in China (hunting prohibited) (Anon., 1984).

Pakistan Occurs in Hazarganji-Chiltan National Park near Quetta (Shafique, 1984).

USSR Present in the Badkhyz and Repetek protected areas in southern Turkmenistan, USSR The following measures (paraphrased) have been proposed as a basis for rational utilisation of *T. horsfieldii* in Kazakhstan (Brushko and Kubykin, 1982).

1. Continue and extend surveys of tortoise population, status and ecology.
2. Ban the sale of tortoises as household pets, thus halving the total harvest (N.B. from the context, it seems that this should be interpreted as meaning a ban in the USSR, not a ban on international trade for the pet market); limit the collection of males and immatures; prohibit total harvest collecting thus leaving a portion of all populations undisturbed.
3. Prohibit collecting before May in order to allow breeding and weight recovery.
4. Prohibit continued collecting at single sites, but collect in rotation, with intervals of several years.

CAPTIVE BREEDING A recent inventory (Slavens, 1985) lists 133 individuals in 26 collections in 1984. Successful breeding in captivity seems to be rare, but is recorded at Tel Aviv in 1980 (Olney, 1983).

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SOUTH AMERICAN RIVER TURTLE

Recommended list: 1 [Problem]

Podocnemis expansa (Schweigger 1812)

Order TESTUDINES

Family PELOMEDUSIDAE

SUMMARY AND CONCLUSIONS One of the largest species of freshwater turtle, formerly very abundant in the Amazon and Orinoco drainages of Brazil, Bolivia, Colombia, Peru, Venezuela, and possibly Ecuador and the Essequibo in Guyana. Now extremely depleted throughout the range and locally extinct. Inhabits lakes and major rivers, moving into flooded forest to feed on vegetation and fruits. Nests in large aggregations on sand banks exposed in the dry season. The primary cause of its decline is over-exploitation for meat and eggs. Although protected in all countries within its confirmed range, it is still hunted illegally and sold at exorbitant prices ($150 in Manaus).

CITES reports reveal few international transactions, with the exception of one shipment of 1292 skins in 1981. This may well represent misidentification of sea turtle skins. International trade is probably of little significance compared with the levels of domestic exploitation. Some cross-border smuggling of turtles for meat occurs around the Amazon basin.

There is little evidence of international trade in this species. The severely depleted state of all remaining wild populations means that any commercial trade is potentially damaging. Therefore Appendix I listing may well be appropriate to help control the current low level of illegal trade and to ensure that no new trade routes emerge.

DISTRIBUTION Widespread in the Amazon, Orinoco and Essequibo drainages.

Bolivia Found in the Mamoré and Guaporé Rivers (Pritchard and Trebbau, 1984).

Brazil Formerly found thoughout the Amazon drainage system, but now virtually extinct in the upper Amazon (Pritchard, 1979), the chief breeding areas are now on the rivers Trombetas, Branco, Purus and Xingu (Alho, 1985).

Colombia Found in the Solimoes, Putumayo and Caqueta rivers in the Amazon drainage; and in the Rio Meta and its tributaries in the Orinoco system (Pritchard and Trebbau, 1984). The Cahuinari watershed, in the Caqueta system, is now the main refuge in Colombia (Hildebrand, 1985).

Ecuador Said by Pritchard and Trebbau (1984) to be possibly present, although no specimens exist; the occurrence was confirmed by Hoogmoed (*in litt.*, 26 August 1986). Iverson (1986) mapped one occurrence on the Peruvian border.

French Guiana Recorded by Groombridge (1982) as possibly present, but Pritchard and Trebbau (1984) concluded that there was no good evidence that the species had ever occurred in the country. Fretey (in press) mentions a specimen captured at Ilet Bache in the Orapak Estuary in the Paris Museum (MNHNP 1980-1462) but indicated that confirmatory observations were needed.

Guyana Said to be present in several rivers (Mittermeier, 1978), including the Essequibo system (Pritchard, 1979). However there are no authenticated records from the country, although shells in the possession of indians have been observed at Lethem, on the Takutu River, a tributary of the Rio Negro (Pritchard and Trebbau, 1984).

Peru Found in the Amazon River system, including the Rio Maranon and Rio Ucayali, although it is said to have been extirpated from the region of Iquitos (Dixon and Soini, 1986). The main surviving nesting area is now on the Rio Pacaya (Pritchard and Trebbau, 1984).

Suriname Pritchard and Trebbau (1984) concluded that there was no good evidence that the species had ever occurred in the country. This was corroborated by Hoogmoed (*in litt.*, 26 August 1986).

Trinidad and Tobago Individuals are sometimes washed up on the south coast of Trinidad by the Orinoco in flood, but no breeding has ever been recorded (Pritchard and Trebbau, 1984).

Venezuela Found thoughout the Orinoco drainage system from the delta to Boca Mavaca in the upper Orinoco; mostly in the main Orinoco, but some ascend the Rio Capanaparo, Rio Cinaruco, Rio Meta, and occasionally the Rio Apuré; the main surviving nesting beach is on the Orinoco, downstream from Puerto Paez, near the Colombian border. There is no evidence of exchange with the population in the Amazon via the Casquiare Canal (Pritchard and Trebbau, 1984). Introduced to Lake Valencia in the Andean Highlands (Pritchard, 1979).

POPULATION Very abundant in previous centuries (Bates, 1863; Goeldi, 1906; Mittermeier, 1975; Smith, 1979), *Podocnemis expansa* was already rapidly declining in the latter half of the nineteenth century, and is now severely depleted throughout most of its range.

Bolivia No infromation.

Brazil In Brazil, the core of the range, many former nesting beaches are deserted (Vanzolini, 1967), it is rare today to find a single *P. expansa* in the Upper Amazon (Mittermeier, 1975). The species was still plentiful enough in the mid-19th century on the Rio Madeira for example, for the gathering of nesting females to impede river traffic, and on one occasion (also on the Madeira) rows of turtles eight to ten deep stretched along the waterside for six to seven miles (Smith, 1974). Similarly, in the late eighteenth century *P. expansa* were reported to be exceptionally large and abundant around Itacoatiara (Amazonas), they were still an important dietary item in the mid-nineteenth century (Smith, 1979), but today they are virtually eliminated and the few that appear on the market come mainly from the Rio Uatuma, 80 km away (Smith, 1979). The Instituto Brasileiro de Desenvolvimento Florestal (IBDF) has embarked on a programme to prevent hunting and to protect *P. expansa* nesting beaches in the Lower Amazon. Between 1976 and 1978 at Leonardo Beach on the Rio Trombetas, there is reported to have been an increase of around 50% in the number of hatchlings produced (Groombridge, 1982). However, Ayres and Best (1979) suggested that such apparent increases might reflect nesting females moving into the relatvely undisturbed nesting beach from other areas, as there was not sufficient time for the reproductive segment of the population to have increased. More recently, this view and the data on which it was based have been questioned as there is still considerable human disturbance. In 1983, 1984 and 1985, there was virtually no successful nesting on the Rio Trombetas. In 1985, out of a previous population of 6000-8000 females on the Rio Trombetas, only 200-300 females nested and only one nest is known to have hatched successfully, the remaining nests having been plundered by the local people (J.A. Mortimer, *in litt.*, 18 October 1986). The most recent estimates of the main breeding populations are given in Table 1. Groombridge (1982) reported that population numbers appeared to be stable on the Guaporé, Branco, Purus and Jurua, and increasing on the Trombetas, Tapajos and Xingu. In view of the fact that the population on the Trombetas still appears to be under severe pressure, the security of populations in other rivers deserves more critical scrutiny.

Podocnemis expansa

Table 1. Estimates of the numbers of nesting females and hatchlings in Brazil. Figures in 1979 from Padua (*in litt.*) cited by Groombridge (1982), for 1978-1982 from Alho (1985), and for 1985 from Mortimer (*in litt.*, 18 October 1986).

River	Hatchlings 1979	Hatchlings 1978-1982	Nesting females 1978-1982	Nesting females 1985
Purus	49000	104300	1117	
Jurua	80000	21400	291	
Guapore	12000	11470	226	
Branco	153000	180756	1935	
Tapajos	18000	18566	353	
Xingu	146000	98450	1859	
Trombetas	480786 *	393345	5184	300

* data from Leonardo Beach in 1978 (Alho *et al.*, 1979).

Colombia Populations of *P. expansa* have declined drastically in Colombia, having disappeared from most of the rivers in which they used to occur. In the Orinoco system they used to be common 20 years ago on the Rios Manacacias, Ete, Casanare and Meta, reaching to within 25 km of Villavicencio. There is still one nesting beach on the Rio Meta, below Orocué (Pritchard and Trebbau, 1984). In the Amazon drainage the Caqueta River is practically the only one where they still exist, nesting at beaches between Pedrera and Araracuara. The decrease in numbers is particularly noticable each year in the nesting season (Hildebrand *et al.*, 1983). An intensive study was initiated in 1983 in conjunction with INDERENA (Instituto para el Desarrollo de los Recursos Naturales Renovables) and Fundacion Estacion de Biologia Puerto Rastrojo. 34 breeding beaches were located, and four main beaches were selected for intensive study. On these four beaches, 87 nests were located in 1983/84, and 43 in 1984/85 (Hildebrand, 1985).

Ecuador No information.

Peru The species is rare in most areas of Amazonian Peru, having been extirpated from the region of Iquitos, where it was once common (Pritchard and Trebbau, 1984; Dixon and Soini, 1986). Viable populations still exist in a few isolated areas, for example in the National Reserve of Pacaya-Samiria (Soini, 1980).

Venezuela The overall decline of the species is exemplified by data from the upper Orinoco in Venezuela. Whereas Humboldt estimated 330 000 animals in 1799 and 1800, numbers were down to an estimated 123 600 in 1945, 36 100 in 1950, and 13 800 in 1965 (Mittermeier, 1978; Ojasti, 1971). Surveys in 1981 indicated that the population was only one-third of that estimated in 1965. The site of this investigation, Playa del Medio on the Rio Orinoco, together with Pararuma beach are the major nesting areas for *P. expansa* in Venezuela. The 1981 season was atypical climatically, with unexpected summer flooding, and it is possible the results were affected by this; however, the results are thought to adequately represent the general situation in Venezuela. Pararuma beach, formerly one of the most important sites in Venezuela, had only 30 nesting animals in 1981 (Groombridge, 1982). Another population, on the Rio Meta along part of the Colombia-Venezuela border, is now also greatly reduced although it was still possible to see aggregations of up to 6000 turtles basking on the beaches even recently (Pritchard and

Trebbau, 1984). The species is considered to be threatened or in danger of extinction (Venezuela CITES MA, 1987).

HABITAT AND ECOLOGY A large freshwater turtle, by far the largest of the living *Podocnemis* species, a maximum length of 89 cm has been recorded, (Pritchard and Trebbau, 1984) although the mean length of a more typical sample of 38 was around 70 cm (Vanzolini, 1967). Males are smaller than females. Individuals may reach 50 kg (Mittermeier, 1978). Occurs in large rivers, oxbow lakes, and during the flood season, in lakes formed by rivers and in flooded forest areas (igapos) (Groombridge, 1982). Turtles re-enter rivers at the start of the dry season as nesting beaches become exposed.

Podocnemis species are omnivorous but predominantly vegetarian, feeding on aquatic plants and fruits that fall into the water, but also consuming animal material such as dead fish (Mittermeier, 1978). Best (1984) provides a table of over 31 species of plant consumed by *P. expansa*.

The growth rate in the wild has been estimated at 0.5 cm a year for mature females or 1.5 cm a year for smaller females (Ojasti, 1971). In captivity in Manaus, hatchlings have grown from a carapace length at emergence of 55 mm (22 g) to 85 mm (85 g) after one year and 112 mm (187 g) after two (Alho and Padua, 1982b). Alho (1985) reports extremely fast growth in captivity, hatchlings attaining 400 g after one year. The age at first breeding is not known, but it appears that females do not mature until they attain a carapace length of 50 cm (Alho and Padua, 1982a). Pritchard and Trebbau (1984) suggest that they may normally not mature until about 15 years old. In captivity they have been known to breed at 8 years old (Alho, 1985).

The nesting season varies from June - July in the upper Amazon in Brazil, to October - November in the lower Amazon. In the Iquitos region, and the basins of the Rio Tapiche and Rio Pacaya, nesting is in August - September. In Venezuela, the species nests from mid-February to early March, when water levels in the Orinoco and its tributaries are at their lowest (hatching here is in early May) (Groombridge, 1982). On the Rio Trombetas in Brazil the nesting season is in the middle of October, turtles begin to gather off the principal nesting beaches in September. On the Rio Caqueta in Colombia there is an extended nesting period from October to about March. Eggs laid in October and November are particularly at risk from flooding (Hildebrand, 1985).

Sand beaches are required; nesting usually occurs in large aggregations on a few selected beaches, although individuals may occasionally nest in outlying areas (Pritchard and Trebbau, 1984, Magnusson, pers. comm.). Basking behaviour by the females, which can be observed until the end of the laying season, begins 15 days before the season begins. This behaviour occurs during the hottest hours of the day, generally from 10.00 until 16.00 hrs. At times 500 animals can be seen basking, with others swimming in the shallow water with their heads above water, breathing or watching the beach (Alho and Padua, 1982a; Alho, 1985).

The turtles emerge silently from the water, led initially by a few individuals, and head toward the higher surfaces of the beach. The actual nesting process is complex, and completion of the nest hole itself may take around 100 minutes (Vanzolini, 1967). An irregular shallow body pit is first scooped out by forceful sweeps of the body and scooping with all four limbs. A deeper pit is then formed, using first one hindlimb then the other, and swinging the body back and forth through 90° as each hindlimb is used in turn. The finished pit is 70-100 cm deep and 100-150 cm in diameter at the mouth. At this stage the turtle's head is about level with the sand surface, and the egg chamber is then formed at the bottom of the pit, partly using the hind margin of the carapace. Egg-laying takes around 15-35 minutes, during

this time the body is at an extreme angle, more than 45° and sometimes almost vertical. Afterwards the nest is filled and the sand is compacted by the raising and rapid lowering of the plastron onto the surface, before the turtle returns to the water (Alho and Padua, 1982a). The clutch size normally varies from 63 to 134 eggs with a mean of 91.5 (Alho, 1985). The largest recorded was 156, laid by a 75-cm (56-kg) female (Pritchard and Trebbau, 1984); in Peru the range in examined nests was 80-133 (Groombridge, 1982). Research at the Rio Trombetas in Brazil showed that clutch size was positively correlated with carapace length. An average of 86 hatchlings emerged (94%) after a mean incubation period of 48 days (Alho and Padua, 1982a). In Colombia, eggs from 15 natural nests hatched with 69% success, with incubation periods between 50 and 60 days; the temperature in the nest chambers varied from 28°C to 35°C, with a mean of 31°C (Hildebrand, 1985). The nesting season coincides with the hottest time of year, and temperatures in the nest chambers at the Rio Trombetas site were found to fluctuate between 30°C and 39°C (Alho and Padua, 1982a). As in other reptiles, the sex of the hatchlings is influenced by the incubation temperature, males predominating when the temperature is low (Alho, 1984; Alho *et al.*, in press).

Tagging of turtles in Venezuela indicates that females breed once a year, and may continue nesting for at least 15 years (Pritchard and Trebbau, 1984).

After emerging the hatchlings move straight down the beach, running the gauntlet of assembled predatory birds, and into the water, where they become prey to a variety of predators, ranging from fish and caimans to herons, vultures and otters (Best, 1984). There is very little natural predation of eggs in the nests, but predation of hatchlings is heavy. Alho (1985) asserted that fewer than 20% of the hatchlings return to the beaches to breed.

Podocnemis expansa and *P. sextuberculata* are notable in that nesting is restricted to relatively low beaches or bars of pure sand; they are thus particularly vulnerable to fluctuations in water level at the nest site (Vanzolini, 1977). For example, in 1973 all *P. expansa* nests on the Rio Trombetas (the largest known present-day nesting area in Brazil) were flooded and destroyed before hatching (Mittermeier, 1978), and in 1980, 99% of the eggs were destroyed (Alho and Padua, 1982a); at Playa del Medio on the Venezuelan Orinoco 25-80% of the annual egg production may be lost in this manner (Mittermeier, 1978). In Venezuela this factor certainly appears to be the principal source of egg and hatchling mortality; natural non-human predation seems to be much less significant (Groombridge, 1982). Whereas most *Podocnemis* nest singly or in small groups, *P. expansa* is exceptional in nesting principally in large, synchronized aggregations, although some solitary nesting also takes place. The social nesting of *P. expansa* recalls the synchonized mass nesting (*arribada*) of most populations of marine Olive Ridley Turtles (*Lepidochelys olivacea*). However, it differs in several respects. For example, in *P. expansa*, nests are concentrated in a restricted area of beach, and the nesting females are highly tolerant of disturbance by other females (Vanzolini, 1967). The reverse is the case in gregarious sea turtles. *P. expansa* digs deeper nests than other species of *Podocnemis*, and so it is possible that the choice of nest site is more restricted owing to the greater danger of flooding.

THREATS TO SURVIVAL The major current threat to the species, apart from the natural mortality caused by flooding of nests, is the very heavy exploitation of adults (including nesting females) and eggs for food. An adult *P. expansa* can provide up to 13-14 kg of meat (Smith, 1974), and this turtle has always been a valuable food resource for the human population, both the local inhabitants and through more distant market outlets (Mittermeier, 1978; Smith, 1974; Smith, 1979).

Although *P. expansa* is one of several turtles that provided a valuable food resource (also a medium of exchange and a source of raw materials) for the indigenous peoples of Amazonia, and is often embodied in tribal mythology, the intensity of exploitation only rose to critical levels following European colonisation (Smith, 1974; Smith, 1979). European traders and missionaries were perhaps mainly interested in *P. expansa* as a source of oil for cooking, lighting and other purposes. The finest oil was prepared by boiling fresh turtle fat, the rest of the turtle was typically thrown away (Smith, 1974). A coarser oil was prepared by crushing eggs. The extent of this exploitation in the eighteenth century was enormous; it was estimated that 5000 jars of oil were harvested annually from three major nest beaches on the Orinoco, each jar contained 25 bottles, each bottle the contents of about 200 eggs. Depending on the precise clutch size, this would represent the wasted reproductive effort of about 400 000 females (Mittermeier, 1975; Mittermeier, 1978). A similar intensity of exploitation was maintained in the Brazilian Amazon (Smith, 1974; Smith, 1979). The females, after laying, were gathered into artificial enclosures along the rivers to provide a food store, for use notably when fish were harder to catch during the flood periods; it is estimated (Smith, 1979) that two million *Podocnemis* were killed annually in the mid-eighteenth century in the state of Amazonas alone. Intensive predation on adults and eggs, sustained over three centuries, has brought *P. expansa* to its present severely depleted condition. The survival of the species may be largely due to the introduction of kerosene and vegetable oils in the latter part of the nineteenth century, replacing turtle products (Smith, 1974).

Habitat modification, notably clearance of floodplain forests that provide a food source for *P. expansa* and other *Podocnemis*, and changes in river regime following construction of hydroelectric dams, constitutes an as yet unquantified threat (Smith, 1979).

Brazil Trade in *P. expansa* for human consumption still occurs. In Manaus important occasions are celebrated with a banquet of turtle, for which very high prices may be paid (Alho, 1985). The increasing rarity of the species has raised the market price until this food source is out of reach of those people who would most need it. Fifty years ago in Manaus, a large *P. expansa* cost the equivalent of US$0.01, but the present-day equivalent may be up to US$80 or $100 (Mittermeier, 1978; Smith, 1979). An animal of 30 kg or more is worth $150 (Groombridge, 1982). In Itacoatiara, much closer to remaining *P. expansa* localities, the price is still $60, and probably fewer than 50 are consumed each year (Smith, 1979).

In 1983 a nesting beach at Monte Cristo, near Fordlandia in Para, was completely devastated when hunters caught all the nesting females (Alho, 1984). Human disturbance of nest sites is an important factor on the Rio Trombetas, the problems being compounded by surveying activity for the hydro-electric dam which is to be built upstream. In spite of protection which is supposed to be given by the staff of IBDF, of a total of an estimated 200-300 nests laid along the Rio Trombetas in 1985, only one is known to have hatched successfully, the remaining nests having been plundered by the local people (J.A. Mortimer, *in litt.*, 18 October 1986).

During regular inspections at Manaus and in control operations on the Rio Purus, 192 turltes were confiscated by IBDF, of which 19% were *P. expansa*. 68% of the turltes were female, 31% male, and the rest juvenile. A total of 75 boats were boarded, and 10 of these were transporting illegally acquired wildlife products (Rebêlo, 1984). Turtles caught in Colombia are also smuggled into Brazil for sale in Tefé (see below).

Podocnemis expansa

Bolivia Mallinson (1966, *fide* Pritchard and Trebbau, 1984) reported that there was heavy exploitation of *P. expansa* at Gujara-Mirim, on the Rio Mamoré, the border with Brazil. During a 6-month season, 3000-4000 turtles were shipped out of this region to Porto Velho.

Colombia Although there has long been subsistence use of turtles by indians, the commercial traffic in *P. expansa* developed mainly in the late 1950s. It became particularly intense in the 1960s, with respites in 1965-1967 and 1971-1976, when the traffic in other wildlife skins (cats, caiman, otters) caused a reduction in the numbers of turtles taken. Trade in turtle skin is virtually non-existant, the major commerce being in adult animals, which are smuggled into Brazil (Hildebrand, 1985).

The local indians along the Caqueta exploit all stages in the life cycle of *P. expansa*: eggs are removed from the nests, hatchlings are caught as they emerge, adult females are taken on the nesting beaches, and adults of both sexes may be caught in the lakes and rivers. A survey of 45 of the 80 families living along the Caqueta River showed that they destroyed over 250 nests of eggs and 60 nests of hatchlings in 1983/84, and 200 nests of eggs and 40 of hatchlings in 1984/85. 250 adult females were caught on the nesting beaches in the first year and 200 the following year. A further 50 or so animals were caught along the rivers in each year. It is estimated that this resulted in a total loss of about 59 000 and 35 000 eggs destroyed in the two years respectively (Hildebrand, 1985).

In 1984 there were approximately ten boats involved in taking turtles caught on the Caqueta down the river to Brazil, where they were mostly offloaded at Tefé. In 1983/84, they took a total of 400 *P. expansa*, 150 of which were consumed on the boats before they reached their destination. The following year only about 70 turtles were taken, owing to improved control measures. It was thought that the presence of the research team had caused a decrease in the volume of trade in 1983/84 to half its previous levels. The price of each turtle rises from CPs700-1000 near the nesting beach, to CPs1500-2500 at La Pedrera, to CPs5000-10000 in Tefé (US$1 = CPs90). There is no commercial traffic in eggs or hatchlings, and all of the adult turtles are shipped out down the river towards Tefé (Hildebrand, 1985).

Venezuela Collection of nesting females was legally prohibited in 1962, and patrolling of the beaches by the Guardia Nacional has reduced the numbers taken to low levels. Some turtles are still captured in the feeding grounds by local fishermen. The creoles tend to use baited hooks and lines, while the indians prefer harpoons and arrows (Pritchard and Trebbau, 1984). A similar price rise to that seen in Brazil has occurred in Venezuela (Smith, 1974). On the illegal market in Venezuela, one animal can fetch Bs400 in Puerto Ayacucho (capital of the Territoria Federal Amazonas); higher prices can be reached, in San Fernando de Apure and Caicara del Orinoco for example (Groombridge, 1982). For a brief period in the early 1960s, hatchlings were exported as pets, but they seldom survived the low temperatures to which they were exposed, and the trade was soon stopped (Pritchard and Trebbau, 1984).

The population of *P. expansa* in Venezuela is thought to be seriously affected by the number of motorized cargo-boats travelling daily between Puerto Ayacucho and the lower Orinoco; this traffic causes great disturbance to the nesting beaches during the breeding season, when turtles are aggregating, basking and nesting (Groombridge, 1982).

INTERNATIONAL TRADE Apart from the illegal cross-border trade in live *P. expansa* for human consumption, noted in the previous section, there are very few reports of international trade in this species. Between 1980 and 1983 the total trade reported to CITES amounted to 1437 skins, five live animals

and three shells, with a few manufactured products such as handbags. No trade in these products was reported in 1984 or 1985 (Table 2). The great majority of this trade comprised a single shipment of 1292 skins, country of origin Colombia, exported from F.R. Germany to Italy in 1981. The skin of *Podocnemis* is normally considered to be of little value and it is possible that these were actually the skins of marine turtles which were declared as *P. expansa* to evade CITES controls (P. Dollinger, pers. comm.). Were it not for this shipment, *P. expansa* would not have featured in the survey of significant trade in Appendix II species. In view of the extensive exploitation for human consumption, it would appear that international commercial trade in skins, if it occurs at all, is insignificant.

Table 2. Minimum net imports of products of *Podocnemis expansa* reported to CITES.

	1980	1981	1982	1983	1984	1985
Canada	-	8 h'bags	-	-	-	-
Italy	35 skins	1292 skins	-	-	-	-
Japan	-	-	3 live	2 live	-	-
UK	-	16 h'bags	1 shell	-	-	-
USA	2 shells	1 shell	-	1 shell	-	-

CONSERVATION MEASURES The protection status of *P. expansa* is summarised in Table 3, where it can be seen that it is nominally protected throughout all its confirmed range. This legislation is difficult or impossible to enforce, and effective protection is largely limited to the major nesting beaches, with occasional attempts to control river traffic. Exploitation is unchecked in other parts of Amazonia (Mittermeier, 1978); in Peru, for example, where legislation simply means that trading continues covertly (Groombridge, 1982).

Table 3. Legal prohibition on the hunting, internal trade and commercial export of *P. expansa*. Dates are those on which the legislation came into force. A - All live animals & parts; P - Allowed under permit (source, mostly from Fuller and Swift, 1985).

	CITES	Hunting	Trade	Export
Bolivia	1979	A 1979	A 1979	A 1979
Brazil	1975	A 1967	A 1967	A 1967
Colombia	1981	A	A	A
Ecuador	1975	-	-	A 1981
Guyana	1977	-	-	P
Peru	1975	A 1973	A 1973	A 1973
Venezuela	1978	A 1962	A 1962	A 1962

The primary requirements in future are to limit continuing over-exploitation, continue and extend protection of nesting beaches, and continue ecological studies with a view to rational management. It has been suggested that controlled exploitation is a preferable option to total protection in Brazil, and outline plans for a ranching scheme have been put forward (Mittermeier,

1978; Alho, 1984; Alho, 1985). Action in Brazil, Peru and Venezuela provides an essential foundation. Specific data should be sought on the movements and fate of hatchlings translocated in the IBDF programme, to aid in design of future conservation action (Groombridge, 1982).

The IUCN/SSC Freshwater Chelonian Specialist Group plans highest priority projects on the ecology and conservation of this and related species.

Brazil Nesting beaches are supposedly protected by the Instituto Brasileiro de Desenvolvimento Florestal (IBDF) on the Rios Trombetas, Xingu, Tapajos, Guaporé, Branco, Purus and Jurua. But the efficacy of the protection, on the Trobetas at least, has been cast into doubt (J.A. Mortimer, *in litt.*, 18 October 1986). The protection planned extends from the pre-nesting aggregation of females until hatching of the eggs. Hatchlings are protected from predation in enclosed waters until full absorbtion of the yolk sac (assumed to be the greatest attractant to predators); they are then released in shallow water near lakes, far from predators congregated at the nest beach. This work is financed by Programas de Polos Agropecuarios e Minerais de Amazonia (POLAMAZONIA). The IBDF, assisted by the Universidade de Brasilia, is collecting data on population size and trends, migration, hatchling and adult behaviour, etc., and attempting to develop an economic model relating to the feasibility of rearing turtles (Groombridge, 1982; Rebêlo, 1984; Alho, 1985). Plans for a comprehensive ranching and release programme were put forward by Alho (1985). At present there are no data on the effects of the IBDF programme of translocating hatchlings to lakes away from the nest beach. Doubts have been expressed as to the likelihood of such hatchlings finding the traditional nesting areas or establishing a new site, and the success of the programme cannot be confirmed until translocated hatchlings have been observed to breed and nest successfully (Groombridge, 1982). Sporadic checks are made on boats passing up and down the Amazon in Brazil (Rebêlo, 1984), but turtles are still sold openly in the market at Manaus.

Colombia A research project was established on the Caqueta river in 1983. Major nesting beaches were located and monitored. Eggs were collected from nests about to be flooded, and were moved to new sites to complete their incubation. Hatchlings from natural nests were also kept in pens for four to six weeks to reduce neonatal predation; they were subsequently released in nearby lakes or islands in the river. The presence of the research staff reduced the numbers of nesting females captured by commercial traders, but it was thought that this effect would cease when the researchers withdrew, unless more effective policing could be established. The local indians and other inhabitants were encouraged to control the exploitation of eggs and hatchlings, and to ensure that any nests opened were fully utilised to prevent wastage. They were encouraged not to take females on the nesting beaches before laying had been completed. They were also persuaded not to work with Brazilian turtle dealers; and river patrols intercepted several boats bound for Brazil. This was reflected in a five-fold decrease in the number of turtles smuggled downriver in 1984/85 (Hildebrand, 1985).

For the future it was thought essential that the research programme on the Rio Caqueta should continue, in order to encourage the participation of the local inhabitants in the conservation measures, and to deter the commercial turtle traders from returning. More effective inspection and control of Brazilian river traffic was advocated. It was suggested that the Cahuinari watershed be turned into a national park to ensure continued protection (Hildebrand, 1985).

Venezuela The effect of rearing and releasing hatchlings in Venezuela in the 1950s and 1960s was uncertain and the schemes were abandoned (Smith,

1974). At present in Venezuela, hatchlings are sometimes rescued from nests in danger of flooding, but the effectiveness of this is unknown. The major nesting beaches in Venezuela are protected by the National Guard (Groombridge, 1982).

CAPTIVE BREEDING Captive breeding has been achieved at the Museu Goeldi in Belem (Alho, 1985). The majority of the other schemes to rear *P. expansa* in captivity involve the use of eggs or hatchlings taken from the wild (Alfinito, 1980). Experience of the incubation of eggs in artificial nests has been documented by Hildebrand (1985). Eggs, threatened by flooding, were moved to new sites to complete their incubation. Of 15 clutches moved in this way, hatchlings were produced from 11, the hatching success varying from 14% to 92%. The low success was thought to be associated with problems of maintaining temperature and humidity.

Apart from the head-starting programmes in Brazil and Colombia, artificial rearing of hatchlings has also been attempted in Brazil at Rio Trombetas, Manaus and Brasilia. High mortality was experienced in Brasilia owing to the low temperatures, and the hatchlings had to be moved to indoor tanks, after which they grew at rates similar to those experienced at the two warmer sites (Alho and Padua, 1982b).

The Centro Experimental para Criaçao em Cativiero de Animais Nativos de Interesse Cientifico e Economico (CECAN), established in 1977 by IBDF and the Ministerio da Agricultura outside Manaus, originally had plans to keep *P. expansa*, but these were subsequently abandoned.

Young *P. expansa* are commonly kept as pets by people living in Amazonia (Alho and Padua, 1982b). A survey of 260 zoological collections in 1985 revealed a total of 18 *P. expansa* in six different collections (Slavens, 1985).

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SPECTACLED CAIMAN

Recommended list: 1
[Problem]

Caiman crocodilus (Linnaeus 1758)

Order CROCODYLIA

Family ALLIGATORIDAE

SUMMARY AND CONCLUSIONS Widely distributed in Latin America from Mexico to Paraguay, this small caiman still occurs in appreciable numbers in many swamps and rivers, occasionally in estuaries. Populations are reported to have recovered slightly as a result of protection in Ecuador, Brazil and Venezuela, but are still declining in many countries, including Paraguay, Bolivia and Colombia.

The species is hunted intensely for skins, over a million of which are in trade each year, the great majority being exported illegally from their countries of origin. Recent protection measures mean that skin exports are now only permitted from El Salvador, Guyana, Venezuela, Bolivia and Suriname.

A major project to assess the distribution and population status of *C. crocodilus* is currently under way in South America, and it would be premature to predict its findings. However it seems pointless to set further controls, as most trade is currently illegal and the existing legislation is obviously being flouted by importers and exporters alike.

Taxonomic Note The taxonomy of what may be termed the '*Caiman crocodilus* complex' is in a highly confused state. In this analysis four subspecies have been recognised. *C. crocodilus apaporiensis* is in Appendix I, and so has not been covered, but the remaining three, *C. c. crocodilus*, *C. c. fuscus*, and *C. c. yacare*, have been treated separately as regards distribution, status, ecology and exploitation. The international trade has been considered together as there is evidence that the subspecies in trade are regularly mis-identified. Some of the major taxonomic controversies may be summarised as follows (references in following accounts):

(1) While a major field authority on South American crocodilians proposed several years ago that the southernmost populations (*C. c. yacare*) are distinct enough to require full species status (*C. yacare*), this opinion has been ignored by most subsequent workers.

(2) The form ranging from Mexico south through Central America to Colombia and north-west Venezuela has usually been referred to as *C. c. fuscus*; it has been proposed that this name should only be applied to the central and eastern populations in Colombia and those in north-west Venezuela, while populations from Pacific Ecuador and Colombia north through Central America are distinct at subspecies level and named *C. c. chiapasius*. While this treatment may be reasonable it is not based on readily-available published work.

(3) Two new subspecies *C. c. mattogrossiensis* and *C. c. paraguayensis* have recently been described, and accepted in a major checklist of the group, while these taxa are regarded as totally without foundation by others more familiar with the field situation.

Overall it appears that variation within the *C. crocodilus* complex is far from adequately represented by the present taxonomy. These might be

considered fairly academic questions, but these uncertainties do appear to hinder effective conservation. It is clearly difficult to design or justify legislation when there is not a consensus position on the taxonomic treatment of animals from a particular area of concern, nor on which populations are most distinct and might thus deserve priority protection (if other factors are equal).

The taxonomic and population status of the whole genus is currently being assessed in a major project involving many South American countries, but principally Brazil, Bolivia and Paraguay. When the results of this are available it should be possible to assess the levels of sustainable harvest with greater certainty.

DISTRIBUTION

Caiman crocodilus crocodilus (Linnaeus 1758)

Northern parts of South America, east of the Andes.

Brazil Throughout the Amazon basin of Brazil with the exception of a few southern tributaries (Brazaitis, 1973).

Colombia Occurs to the east of the Andes, in the Amazon and Orinoco drainages.

Ecuador Found in the Amazonian region (Asanza, 1984).

French Guiana Present (Medem, 1973).

Guyana Present (Medem, 1973).

Peru Found in the Amazonian region (Medem, 1973).

Suriname Found throughout the northern plains and swamps (Glastra, 1983).

Trinidad and Tobago In Tobago the range is now limited to a few rivers along the south coast and to the lake behind the Hillsborough Dam. Also present in Trinidad. An adult animal was caught swimming in the sea, 5 km north-east of Tobago in 1979 (Hardy, 1982).

USA Introduced, probably as a result of escapes of pet animals, there is a small breeding population in South Florida (Behler and King, 1979).

Venezuela Found throughout the Llanos and the Guyanan region as far as Amazonia (Maness, 1982; Gorzula and Paolillo, 1986). Also recorded from numerous localities along the north coast. The north-west of the country is populated by *C. crocodilus fuscus* and the exact range of the two subspecies is not known. However it is thought that the boundary is the Yaracuy River, with only *C. crocodilus crocodilus* eastwards from there (Seijas, 1986).

Caiman crocodilus fuscus (Cope 1868) (Brown Caiman)

Extends from southern Mexico and Nicaragua, south through Central America to the Pacific slopes of Ecuador, Colombia and to north-west Venezuela.

F. Medem (the major authority on the genus *Caiman*) recommends (Smith and Smith, 1979) that the populations of the Magdalena and Sinu river systems in

Colombia (extending into north-west Venezuela) be considered distinct from those of the Colombian Pacific coast, Central America and Mexico (Medem, 1973). By this interpretation, which does not appear to be widely followed, the coastal form is referred to as *Caiman crocodilus chiapasius* (Bocourt) and the name *C. crocodilus fuscus* is restricted to the Magdalena-Sinu and Venezuela population.

Colombia West of the Andes, including the Magdalena and Sinu rivers, and along the north coast to the Venezuelan border; also found on Isla Gorgona (Medem, 1979).

Costa Rica Occurs along both the Pacific and the Caribbean coasts (Smith and Smith, 1979; Mena Moya, 1978; Wermuth and Fuchs, 1978).

Cuba Introduced into Lanier Swamp, in the south-west of Isla de Pinos (Juventud) in about 1959 (Varona, 1980; Garrido and Jaume, 1984).

Ecuador Occurs west of the Andes in the extreme north of the country.

El Salvador Present (Serrano, 1978).

Guatemala Occurs along the Pacific coast (Smith and Smith, 1979; Wermuth and Fuchs, 1978).

Honduras Occurs along both the Pacific and the Caribbean coasts (Wermuth and Fuchs, 1978; Smith and Smith, 1979).

Mexico Recorded from the Chiapas and the extreme south of Oaxaca, on the Pacific coast (Smith and Smith, 1979).

Nicaragua Occurs along both the Pacific and the Caribbean coasts (Smith and Smith, 1979; Wermuth and Fuchs, 1978).

Panama Occurs throughout the length and breadth of the country (Wermuth and Fuchs, 1978; Panama CITES MA, 1985).

Puerto Rico Introduced to Puerto Rico; there are reports of specimens from Rio Manati and from areas east of San Juan (Schwartz *et al.*, 1978; Schwartz and Henderson, 1985).

Venezuela Occurs around Lake Maracaibo, and along the north coast as far as the Yaracuy River, although the exact eastern limit is not certain (Maness, 1982; Seijas, 1986).

Caiman crocodilus yacare (Daudin 1802) (Yacare Caiman)

Central-southern South America; in the Paraguay River drainage from the Pantanal and Mato Grosso to north Argentina; also the southern tributaries of the Amazon.

Although generally treated as one of the several subspecies of *Caiman crocodilus*, F. Medem, the authority on the genus, prefers to regard this form as a full species, *Caiman yacare* (Medem, 1960). Two recently described taxa accepted by some authorities (Wermuth and Mertens, 1977), *C. crocodilus matogrossiensis* and *C. crocodilus paraguayensis*, are regarded as *C. crocodilus yacare* by Medem (Groombridge, 1982).

Caiman crocodilus

Argentina Found from the Chaco to Corrientes as far south as 30°N (Fitch and Nadeau, 1980). Recorded in Buenos Aires, Misiones, Corrientes, Entre Rios, Santa Fe, Santiago del Estero, Chaco, Formosa and Salta (Waller, 1987).

Bolivia The taxonomic status of subspecies of *C. crocodilus* in Bolivia is under dispute. *C. crocodilus yacare* undoubtedly occurs in the south of the country, but some of the populations in the north may be *C. crocodilus crocodilus*. The species's distribution includes the southern tributaries of the Amazon (the Mamoré, Itenez and Beni); also the Guaporé on the Bolivia-Brazil border. In the south it has been recorded from the drainages of the Rio Paraguay and the Rio Pilcomayo (Groombridge, 1982).

Brazil Pantanal and Mato Grosso regions of south-west Brazil also the southern tributaries of the Amazon (the Araguaia above its confluence with the Tapirape), also the Guaporé on the Bolivia-Brazil border (Groombridge, 1982).

Paraguay Widespread.

POPULATION Populations of *C. crocodilus crocodilus* generally appear to be at least stable throughout much of South America, with the exception of Colombia, Peru and some parts of Guyana. This taxon might well be more appropriately considered non-threatened, were it not for the reported recent increase in hunting pressure, and the lack of data - due to trans-border smuggling - concerning the extent of exploitation in particular areas.

C. crocodilus fuscus has been reported as depleted in Colombia and Ecuador, relatively abundant in parts of southern Mexico. Few recent data on populations in Central America. Further information is given below for those countries for which it is available.

The overall status of *C. crocodilus yacare* is uncertain; each of the four countries in the range is reported to hold some apparently adequate populations, while the taxon is depleted or extirpated elsewhere. It is under considerable hunting pressure.

Argentina Reportedly approaching extinction (Groombridge, 1982). However, a population estimated at 200 000 individuals in 1979 (not confirmed by a full census) remained in the Esteros de Ibera, an immense swamp in Corrientes, 200 km x 100 km at its widest point (Fitch and Nadeau, 1980).

Bolivia A 1978 census in the Mamoré, Beni and Itenez regions, covering an area of 693 082 km^2, resulted in an approximate total of 3 500 000 individuals. Reportedly relatively common in 1973 in the Rio Madre de Dios. Recent studies at Lugo Tumi-Chucua (Beni) indicated over-hunting had occured; immatures were common, an average of ten caimans were seen each night. Reported to be relatively common in the eastern lowlands in 1976-77, including the Isiboro-Sécure National Park, also reported extirpated from parts of the eastern plains (Groombridge, 1982).

Brazil *C. crocodilus crocodilus* populations are recovering rapidly since professional hunting was banned (Vanzolini and Gomes, 1979). *C. crocodilus* is now caught fairly frequently in gill nets in floodplain lakes, even near Manaus, and can be seen without difficulty on tributaries of the Amazon such as the Rio Negro and Rio Tocantins (Smith, 1980). Magnusson (1982) reported that it occurred in high numbers in most areas, and that populations appeared to be limited by habitat preference rather than by disturbance by man. It has even colonised the artificial lakes formed behind the Transamazonian Highway,

and has increased in areas where populations of *Melanosuchus niger* have been reduced by hunting.

C. crocodilus yacare was reportedly relatively common in parts of the Mato Grosso area, although severely depleted locally. A significant population occurs in the Caracara Reserve and at the Paraguai Pantanal (Crawshaw and Schaller, 1980; Groombridge, 1982). In 1977, 30-40 adults were observed from May to June along a 20-km stretch of road from Cuiaba to Poconé, 20-30 large individuals were also observed basking at a cattle ranch within 10 km (Groombridge, 1982). In the Pantanal there has been a drastic decline in populations of Yacare over the last five years. Among other reasons, this is causing concern as it is reported to be accompanied by a corresponding increase in numbers of Piranhas (Hyman, 1985). Brazaitis (1985) reported that the populations in the Pantanal were barely stable if not declining; most of the caimans seen were less than 2 m long, smaller than in previous years.

Colombia *C. crocodilus crocodilus* was reported in late 1970s to be rarely hunted on the Vaupes and Guayabero-Guaviare rivers because the price of petrol, salt and air transport to Villavicencio and Bogota were too high. Juveniles are now seen often, with some adults reappearing. There is a healthy population in the 'Tomo-Tuparro' Faunistic Territory, a 600 000 ha. reserve maintained by INDERENA. In 1975, 350 caimans, mostly juveniles were counted in the lagoons and backwaters of the Capanaparo River (Medem, undated). However, some hunting continues in the Llanos (Orinoco plains), the fact that most hides are between 30-60 cm may suggest that adults have been virtually wiped out from this area (Medem, 1980).

C. crocodilus fuscus was reportedly seriously depleted (Medem, 1971; Medem, 1973), mainly by hunting, and particularly along the Caribbean coast between Ciénaga Grande and the Magdalena River, also on the lower and middle Magdalena (Medem, 1980). There is a healthy and abundant breeding population in the Laguna de Cabrera, Isla Gorgona, comprising at least 28 adults and sub-adults (Medem, 1979).

Costa Rica Included in a list of animals threatened with extinction, although *C. crocodilus fuscus* is said to be abundant in the Rio Tempisque and in Tortuguero National Park, where it is "almost impossible not to see it" (Mena Moya, 1978).

Cuba The introduced population has thrived, to the detriment of the endemic *Crocodylus rhombifer* because of predation of the young (Varona, 1980; Garrido and Jaume, 1984).

Ecuador *C. crocodilus crocodilus* was reported to be not seriously endangered in 1973 (Medem, 1973). In 1983, populations were said to be thriving in some areas, and indians reported that they had increased in recent years (Asanza, 1984). However, populations of *C. crocodilus fuscus* have been described as seriously depleted; must be considered endangered (Medem, 1971; Medem, 1973).

El Salvador Said to be in danger of extinction, and to be in need of a 10-year ban on hunting to allow the population to recover (Serrano, 1978).

French Guiana Reported in 1973 to be in no serious danger of extinction (Medem, 1973).

Guatemala The population of *C. crocodilus fuscus* in the country is thought to be in the region of 10 000-12 0000 (O. Menghi, pers. comm.).

Caiman crocodilus

Guyana In 1973 Guyana populations were still abundant in most areas but were declining in areas where habitat had been lost to agriculture, particularly rice fields (Medem, 1973).

Honduras *C. crocodilus* is relatively more abundant than *Crocodylus acutus*, and its population is said to be "in balance with the habitat" on the north coast (Honduras CITES MA, 1985).

Mexico Reported to be relatively abundant (Alvarez del Toro, 1974; Medem, 1973). At Chiapas still common in some areas but declining due to over-exploitation (King and Brazaitis, 1971). In recent years exploitation has diminished somewhat as the species has become more scarce (Alvarez del Toro, 1974), and it is now considered to be in danger of extinction (Flores Villela, 1980).

Nicaragua No information.

Panama Said to be moderately common and widespread (Panama CITES MA, 1985).

Paraguay Years of excessive hunting have drastically reduced populations. However, some individuals remain even in traditional hunting areas. Much of the range is relatively inaccessible and some populations are likely to persist (Groombridge, 1982). *C. crocodilus* was said to be "scarce" in the Parque Nacional Defensores del Chaco in 1978 (Torres Santibanez, 1978).

Peru Reported seriously depleted in 1973, judging by a rapid decline in numbers of hides exported (Medem, 1973). In the Parque Nacional del Manu *C. crocodilus* was said to be "frequently observed" in 1979 (Pereya, 1979).

Puerto Rico No information.

Suriname Reported in 1973 to be abundant in suitable habitat in Suriname, with populations as close to an untouched state as could be found (Medem, 1973). By 1983, some large-scale hunting had depleted populations in the Coesewijne river and swamp area, although the species was still locally common along the north coast and its status was not thought to be critical (Glastra, 1983).

Trinidad and Tobago Abundant in parts of Trinidad including the vicinity of the capital (Medem, 1973). In Tobago it was formerly widespread throughout most of the rivers and marshes but its range is now limited to a few rivers along the South coast. It was reported to be quite abundant in the lake behind the Hillsborough Dam (Hardy, 1982).

Venezuela *C. crocodilus crocodilus* was described as still relatively abundant (Medem, 1973); since hunting was made illegal in 1973, the populations of *C. crocodilus* have increased in most regions, particularly in the Llanos, where farmers have complained about the high densities. The construction of dams and reservoirs on cattle ranches has greatly increased available habitat. The Ministerio del Ambiente y de los Recursos Naturales Renovables (MARNR) censused 17 private ranches in the states of Apure, Guarico and Bolivar in 1982/83 and extrapolated the results to a further 39. They estimated the total population on these ranches to be 700 000 to 1 000 000 from which a cull of 70 000 was authorised (Quero de Pena, 1984). In Estado Bolivar it is difficult to find a body of water where this species does not occur. In the Guyana region Gorzula and Paolillo (1986) estimated the density of *C. crocodilus* in lakes and ponds to be 6.64 ha^{-1} or 23.42 km^{-1} of shore. Rivers in the same region supported densities of 2.52 km^{-1}. It was not thought that the populations of caiman in this region were under threat,

at the prevailing level of human development (Gorzula and Paolillo, 1986). The density of *C. crocodilus* in the state of Anzoategui (assumed to be *C. crocodilus crocodilus*) was estimated in 1984 to be 26.3 km^{-1} in the Rio Unare, and 1.2 km^{-1} in the Rio Neveri. It was thought that the populations were not only abundant, but may even have increased. Reasons for this included the creation of new habitat, in the form of reservoirs, and the elimination of *Crocodylus acutus*, a potential competitor. In areas where the two species coexisted the populations of *C. crocodilus* were lower than elsewhere and only increased where the numbers of *Crocodylus acutus* had declined. The only thing which appeared to be limiting the spread of *C. crocodilus* populations was adverse ecological factors, such as saline conditions (Seijas, 1986).

Populations of *C. crocodilus fuscus* were censused in 1984. A total of 830 was counted in five reservoirs, the mean density being 5.8 indiviuals per km of perimeter. The density in rivers in the states of Zulia and Falcon varied from 0.7 km^{-1} to 196.6 km^{-1}, the latter in a short stretch of the Rio Sanare. Large populations of *C. crocodilus* are also known to occur in the South of the Lago de Maracaibo, which was not surveyed on this occasion. It was thought that the populations were abundant throughout the north-coastal region, and were increasing in some parts (Seijas, 1986).

HABITAT AND ECOLOGY *Caiman crocodilus crocodilus* seems to prefer the quiet waters of lakes, ponds, swamps and marshes, sometimes in brackish waters (Groombridge, 1982), or along the bends and meandering tributaries of large rivers where the currents are slight. However it may also occur in fast flowing water and near rapids (Vanzolini and Gomes, 1979). It is rarely found in small forest streams, although it occasionally ventures into them (Magnusson, 1982). *C. crocodilus fuscus* has similar habitat preference, occurring in swamps, lagoons, small streams, and tributaries, rather than in the larger rivers. It does, however, enter brackish and salt water, which accounts for it occurrence in forest ponds on off-shore islands. *C. crocodilus yacare* prefers open waters, marshy savannah, lakes, lagoons and rivers; avoids brackish or salt water (Groombridge, 1982).

The maximum size of *C. crocodilus crocodilus* is about 2.5 m, males growing larger than females, and also maturing at a larger size. Growth of juveniles is thought to be in the region of 30 cm a year up to 1 m, slowing down after maturity is reached (Rebelo and Magnusson, 1983). *C. crocodilus fuscus* is a small form, reaching 1-2 m in length (Groombridge, 1982). *C. crocodilus yacare* is reported to attain lengths of 2.5-3 m (Fitch and Nadeau, 1979; Medem, 1973), maximum size recently encountered in Bolivia (Groombridge, 1982) was 0.88 m snout-vent length in females, 1.2 m snout-vent length in males.

Studies in the Venezuelan Llanos suggest that behavioural adjustment to the daily pattern of solar radiation plays a major role in determining daily activity. Individuals tend to submerge during the hottest part of the day, particularly at the end of the dry season. At this time of year they may also be found buried in the mud of shallow pools and in leaf litter in shaded parts of the forest. When water temperatures are seasonally high (29°-30°C) daylight hours are spent in the water, in the evenings many individuals move on shore and remain there for much of the night. When water temperatures fall, individuals spend several hours in the morning on land on sunny days. Body temperatures are maintained relatively constant (30-33°C during the day, and 26-30°C at night) during the transition from dry to wet seasons (Lang, 1977).

Caiman crocodilus

Juvenile *C. crocodilus crocodilus* of up to nearly a meter in length feed entirely on aquatic invertebrates, such as crustaceans and insects. Adults are opportunistic feeders taking whatever they can kill, ranging from snails to small deer and pigs (Magnusson, 1982; Maness, 1982; Gorzula, 1978). A majority of all food items found in the stomach contents of caimans caught during the wet season in Bolivar State, Venezuela was frogs, especially *Bufo granulosus* and *Pleurodema brachyops* (Gorzula, 1978). There seemed to be little feeding during the dry season (Gorzula, 1978). Anurans have been reported in the diet from Venezuela, armoured catfish as the main food item in Guarico state, whilst the aquatic snail *Pomacea ursus* and crabs are most frequently taken in Apure state (Gorzula, 1978). Adult *C. crocodilus fuscus* feed on snails, crustaceans and fish (Alvarez del Toro, 1974; Brazaitis, 1973; Medem, 1973). *C. crocodilus yacare*: snails, crabs (Brazaitis, P., cited in Groombridge, 1982) and fish (Fitch and Nadeau, 1980) are major food items; rodents, snakes and turtles are also consumed (Fitch and Nadeau, 1979; Crawshaw and Schaller, 1980). In Corrientes a principal prey is *Serrasalmus spilopleura*, a species of pirana. This species has increased rapidly in the last decade in Corrientes, possibly as a result of the decrease in Yacare, and is reportedly preying heavily on the offspring of other species including game fish (Fitch and Nadeau, 1980). Where Yacare have been eliminated, the incidence of schistosomiasis among cattle has risen sharply, possibly in proportion to an increase in abundance of snails (an intermediate host for the parasite causing schistosomiasis) upon which Yacare feed (Medem, 1973).

In the case of *C. crocodilus crocodilus* copulation usually takes place near the end of the dry season, with nesting from mid-August to early November. In the Venezuelan Llanos courtship and breeding was observed from May-August during the early wet season, with nesting beginning in August, and reaching a peak in September. Nesting strategies are related to rainfall patterns and vary depending on local conditions. Mound nests, constructed of vegetable materials, average 117 cm length, 104.5 cm width and 44.5 cm height (Stanton and Dixon, 1977). 14-40 eggs are laid and hatch in 70 to 90 days, at nest temperatures of 28° to 32°C. In areas where hunting activity has not altered behaviour the female defends the nest very actively (Groombridge, 1982). Eggs vary from spherical to elliptical, average size 63.8 mm x 40.7 mm average weight 59.9 g. The major egg predator in the Venezuelan Llanos is the lizard *Tupinambis* sp. (Stanton and Dixon, 1977). In Venezuelan Guayana young caimans remained together for around 18 months (Gorzula, 1978).

Research involving *C. crocodilus fuscus* in Colombia showed that breeding takes place all year, but usually from January to March. In Chiapas, nesting is reported to occur between April and September (Flores Villela, 1980). Fifteen to 30 eggs are laid in a mound nest, constructed by the female from organic debris. Nests are usually within 30 m of water, but they have been recorded up to 200 m away. A well developed pattern of maternal care has been reported from observations made in Mexico. Hatching takes place in 75-80 days (Alvarez del Toro, 1974).

In Brazil nesting of *C. crocodilus yacare* takes place during the rainy season between December and April. Eggs are laid in a mound nest of organic material, constructed by the female. Average nest size in Brazil was 134 x 117 cm, and 40.5 cm high. Eggs are elliptical, white, hard-shelled and rugose; around 68 x 43 mm, weighing around 73 g. Average egg size varies considerably between clutches (Crawshaw and Schaller, 1980). Average clutch size in Brazil is 31 (range 21-38), in Bolivia 33.6 (23-41) (Groombridge, 1982). The peak of hatching is in March. During incubation, the female visits the nest at intervals, usually at night. Nests are often abandoned when disturbed by man. At hatching time the female opens the nest, allowing

the hatchlings to escape, there is some evidence that she may crack open the eggs to ensure a simultaneous hatch. It is not known how long the female guards hatchlings after they enter the water (Crawshaw and Schaller, 1980). Major egg predators at Paconé, Brazil include the Coati *Nasua nasua* and the Crab-eating Fox *Cerdocyon thous*, with local reports of predation by tegu lizard *Tupinambis* sp. and Capuchin Monkey *Cebus apella* (Crawshaw and Schaller, 1980).

The production of excrement by large populations of caimans may form an important input of nutrients in certain otherwise nutrient-poor aquatic ecosystems. The decline in caiman populations in certain mouth lakes of the central Amazon region has been followed by diminished fish populations, attributed to a decline in the invertebrate prey of young fishes (Fittkau, 1970; Glastra, 1983).

Caiman crocodilus crocodilus is highly adaptable, and is quick to re-establish itself in habitat vacated by *Melanosuchus niger* and *Crocodylus intermedius*. This may account for the temporary increase in some populations as *Melanosuchus* becomes extinct. The species has in fact established itself in man-made ditches and canals in parts of Florida, USA, and in newly-formed artificial lakes behind the Transamazon Highway in Brazil (Magnusson, 1982). In studies carried out at Lago Amana (an effluent of the Rio Japura) and the Parque Nacional da Amazonia, numbers appeared to be limited by habitat preference rather than disturbance by man, despite heavy hunting pressure.

The distribution of *C. crocodilus fuscus* overlaps that of *Crocodylus acutus* and *Crocodylus moreletii*, but *C. crocodilus fuscus* is only sympatric with *C. acutus*. *C. crocodilus yacare* occurs in sympatry with *Melanosuchus niger*, when it retreats to smaller creeks and streams to avoid the larger species, and with *Caiman latirostris* in the south. It appears to be capable of out-competing *C. latirostris* for available habitat (Crawshaw and Schaller, 1980). However, this may be the result of selective hunting for *C. latirostris*, with the consequent expansion of *C. crocodilus yacare* into the vacant niche (Fitch and Nadeau, 1980). Yacare are migratory and may travel overland for considerable distances while moving from stream to stream.

THREATS TO SURVIVAL Legal and illegal hide hunting and the lack of adequate enforcement to control smuggling, are the major factors contributing to the pressures placed upon the species (Fitch and Nadeau, 1980; Medem, 1971; Medem, 1973).Although the belly skin of *C. crocodilus* contains well-developed osteoderms (Hunt, 1969), renewed hunting pressures are being applied to the species as the more desirable hides of *Melanosuchus niger* and true crocodiles become unavailable. It is reported that commercial interests, with the renewed legal trade in hides of some populations of *Alligator mississippiensis*, have rekindled the demand for crocodilian products in world fashion. The hide of *C. crocodilus* is an economically attractive product with which to meet this demand (Groombridge, 1982).

C. crocodilus yacare produces the most desirable and largest hide of all the *Caiman crocodilus* group. Although Yacare does bear ventral osteoderms, these are not as extensive as in other *Caiman crocodilius*. Flank hides are comparable in size and near in quality to the Black Caiman *Melanosuchus niger*. Thus, shoes made from Yacare may retail at prices nearly equal to *M. niger*, are made of more readily available hides, and are cheaper to purchase raw. Profits for those items become greater, and commercial demand is therefore great. It is difficult for law enforcement agents to distinguish

small products made from Yacare hide from those made from of other members of the genus *Caiman* (Brazaitis, P., cited in Groombridge, 1982).

It is possible that *C. crocodilus crocodilus* may not be greatly affected by low levels of hunting because of its small size at sexual maturity (130 cm). Hunters usually select animals longer than 110 cm, and as the hunting is seasonal, many females can reach breeding size before they are subject to hunting pressure. *C. crocodilus* is therefore thought to be able to withstand low levels of exploitation better than larger species, such as *M. niger*, which is taken at a size much smaller than that at which it is likely to breed. However one other aspect of the trade in *C. crocodilus* skins is that it is usually accompanied by a small trade in the skins of *M. niger*. This this enables populations of *M. niger* to be exploited at levels below those which would be commercially viable in isolation, and could cause the extinction of *M. niger* (Magnusson, 1982; Rebêlo and Magnusson, 1983).

Conversion of habitat for agricultural purposes has caused a decline in some regions, such as the rice fields in Guyana. Consumption of the meat on a non-commercial basis by local people is not an important threat at present (Medem, 1971; 1973; 1980).

Argentina An estimated 20 000 caimans, largely Yacare, are taken annually from Corrientes (Fitch and Nadeau, 1979). Hunting is usually carried out at night, either with baited hooks, or with rifles and harpoons. Many of the larger ranchers are conservationists, and will not allow hunters on their land, but the surrounding smaller farms often provide a means of access (Fitch and Nadeau, 1980). In Corrientes much former habitat has been lost to agriculture or ranching. In areas where *C. crocodilus* co-exists with *C. latirostris* the severe depletion of the latter species by selective hunting seems to have benefited *C. crocodilus* (Fitch and Nadeau, 1980).

Bolivia Bolivia is the main tanning country in South America and skins are imported from surrounding countries for processing before being re-exported (Groombridge, 1982). From January 1st to August 31st 1976, 124 114 Yacare hides were exported (Medem, undated). Although Bolivian protective laws are now more strongly enforced the hide industry remains powerful. Large numbers of hides are taken from Brazil and Paraguay and are then tanned and exported from Bolivia (Medem, 1973). Most skins of a shipment of 300 000 caiman hides from Bolivia intercepted in Florida are thought to have originated in the Pantanal region of south-west Brazil (Groombridge, 1982).

Brazil Hunting has been illegal since 1967, and although some still occurs, there is evidence that populations of *C. crocodilus* have recovered. There is no direct trade in crocodilian skins through major Brazilian ports. However because of the size, and remoteness of much of the Amazon basin within Brazil it is very difficult to enforce the law and hundreds of thousands of crocodilian skins are transported annually across remote parts of the Colombia border (Magnusson, 1980). An analysis of reptile skins confiscated in Amazonia by the Instituto Brasiliero de Desenvolvimento Florestal (IBDF) showed that the great majority were of *C. crocodilus*. The size distribution of skins showed that hunters had apparently selected animals longer than 110 cm (Magnusson, 1982; Rebelo and Magnusson, 1983).

There is still considerable illicit hunting of *C. crocodilus yacare* in the Pantanal, organised on a large scale. The skins are mostly smuggled over the border in light aircraft to Bolivia and Paraguay, where they are often bartered for cocaine. In August 1983 a major law enforcement operation was carried out by the wildlife authorities supported by military personnel and

equipment. Many poachers were arrested, and 1800 Yacare skins were confiscated, although this is a tiny percentage of the annual illegal harvest. Each skin is worth US$1-4 to the hunter, who may collect up to 100 in a night, providing an income considerably in excess of the minimum monthly wage of US$70. The penalties for poaching are low; many of the poachers arrested were released, and the excercise has had little effect in controlling the trade (Hyman, 1985). The poachers are often better equipped than the law enforcement officers, and new road construction will make access possible all year round. There was reported to be pressure to allow a legal harvest in 1986, but no management programme had been formulated, and it was hoped that the plan would not receive approval. The poaching in the Pantanal was considered to be largely driven by overseas demand for caiman skin, particularly from France, F.R. Germany, Itlay and the USA (Brazaitis, 1985).

Colombia Although the export of caiman skins under 1.5 m has been prohibited in Colombia since 1973, a trade in this species continues. In 1974, 556 422 *C. crocodilus* were exported, 84% under the minimum legal length (Smith, 1980). Leticia, in the Colombia Amazon, is a major outlet (Medem, 1973; Smith, 1980). Many skins come from individuals killed in Peru and Brazil and smuggled over the border. The minimum legal size restrictions are not enforced (Smith, 1980). Along the Caribbean coast between Ciénaga Grande and the Magdalena River illegal hunting is common, also on the lower and middle Magdalena. Almost all hides are of hatchlings or juveniles (Medem, 1980). Some refuge is found in lagoons along the lower and middle Magdalena Valley, where aquatic vegetation has become more extensive with the decline of manatees (Medem, 1980). Additionally, hatchlings are killed in large numbers and are preserved as curios for sale to tourists. For many years, *C. crocodilus* hatchlings from Colombia and Ecuador had provided crocodilian pets for the world pet trade. It is estimated that legal export figures reflect about one half of the true number of hides exported from Colombia and Peru, a large number of those animals killed spoil before reaching the tanneries. In many instances, the animal is killed for its flanks only, the remainder of the body left to waste (Groombridge, 1982). Marked habitat destruction has occurred in Colombia including the officially protected mangroves of the Isla de Salamanca National Park (Medem, 1980).

Costa Rica There is said to be illegal exploitation for skins in Costa Rica (Mena Moya, 1978).

Ecuador For many years, hunters and traders have been taking skins illegally over the border into Peru and Bolivia; however, recently, the border controls have been improved and the trade has declined. There is some traditional use of caiman products for medicinal purposes (Asanza, 1984). Oil developments have opened up new towns in Amazonia, and new roads have been built, with accompanying deforestation. There are reports of increasing pollution of the waterways by the uncontrolled dumping of oil/water mixtures (Asanza, 1984).

Honduras Hunting of *C. crocodilus* is illegal in Honduras unless the hunter operates a farm, and has achieved growth and breeding. No farms were functioning in 1985 (Honduras CITES MA, 1985).

Mexico Caimans are much persecuted in Chiapas, primarily for the skin trade. They are protected under legislation which sets closed seasons and a minimum size of 1.5 m, but in general the laws are not well enforced and they are considered as a free resource. There are several skin companies which exploit *C. crocodilus fuscus*: one company was reported to process 1000 skins a month. Dried juvenile specimens are also often sold as curios. In 1970,

small ones (60 cm) sold for Ps50, and larger ones (120 cm) for Ps150. In 1980, corresponding prices were Ps300 and Ps500 in San Cristobal las Casas, or Ps150 and Ps200 in Tuxtla Gutierrez (Flores Villela, 1980).

Panama Trade in wildlife in Panama has been giving cause for concern since at least 1978, when "caiman skins" were amongst the species being traded. At that time there were ten companies involved in the import, export and re-export of wildlife products. Legislation did not control the shipment of goods in transit through Panama, and companies were said to import animals from overseas without adequate documentation, and then to re-export them. Occasionally additional animals, caught within Panama, would be included in the re-export consignment without being declared (Vallester, 1978). Currently, the major threat is more from persecution by people who think that caimans are dangerous. Hunting for skins is very much less important (Panama CITES MA, 1985).

Paraguay Many hides have been exported by Paraguay to France, F.R. Germany and the United States despite national protective legislation. Paraguayan authorities claim that the export documents are forgeries (Groombridge, 1982). Paraguay provides an important staging post for skins brought illegally out of Brazil. Figures collected by the Ministerio de Agricultura y Ganaderia showed that around 1000 skins of *C. crocodilus* were exported in 1984 (Acevedo Gomez, 1987).

Peru A total of 101 641 *C. crocodilus* hides were exported from Peru from 1962 to 1967 (Smith, 1980).

Suriname Large-scale hide-hunting was reported in two consecutive dry seasons around November 1978 and 1979 in the Coesewijne Swamp area. This resulted in the loss of 1500-2000 caiman. Although the species is not legally protected in Suriname, conservation organisations launched a press campaign to stop the hunting, and, in 1980, none was reported (Glastra, 1983).

Trinidad and Tobago Abundant in parts of Trinidad, but illegally hunted on a limited scale. The population in Tobago is not subject to hide hunting (Medem, 1973).

Venezuela Crocodilians have traditionally been exploited by indigenous peoples in Venezuela for food, medicinal and religious purposes, but these uses probably had a negligible effect on the populations (Maness, 1982). Commercial hide-hunting caused the systematic degradation of caiman populations to such an extent that the species was declared totally protected in 1973. Over the next 20 years the populations built up until renewed exploitation was not only thought feasible, but was demanded by farmers to allow the control of the growing numbers of caiman. A proposed harvesting programme was discussed at length at a meeting of the IUCN/SSC Crocodile Specialist Group which was held in Caracas in 1983, and received provisional approval for a trial period. In 1982/83 MARNR conducted a survey of 56 ranches, and recommended a harvest of 70 000 caiman, being 7-10% of the estimated population. Hunting was only allowed on private ranches in three states, between 1 January and 30 April, and size limits of 1.5 m to 1.7 m snout-tail length were imposed. Export of raw hides was prohibited, and 5-6 tanneries were operating in the country to provide tanned skins for export (Quero de Pena, 1986). After the harvest had been permitted for two seasons, it was suspended by a Ministerial Resolution in October 1985. This was reportedly due to abuse and mismanagement in issuing hunting tags. Tags were issued in excess of the quotas set, and hunters were reported to have taken additional skins to make up for those spoiled by improper preservation

(Gorzula, 1985). There is known to be a small amount of illegal hunting taking place, particularly in the Orinoco Delta, whence skins have been smuggled to Trinidad and Guyana. Indigenous peoples also hunt alligatorids for subsistence: in the Amazon Territory they accounted for 30% by weight of the wild animal meat consumed by the Ye'kwana Indians in one 7-month study. Over the same period the comparable proportion for the Yanomamö Indians was only 2%. A figure of 2.5% was quoted for the 350 Pemon Indians in Estado Bolivar. There is very little commercial use of caiman meat, and none was seen being sold in markets or restaurants, although the Criollo people in the Guyanan region are known to eat them occasionally (Gorzula and Paolillo, 1986). Caiman hunting in the Llanos is so easy that populations can be quickly eliminated from many areas.

The populations of caimans in the north-west of Venezuela probably escaped the worst of the effects of the over-hunting which afflicted the remainder of the country in the 1950s and 1960s; one exception was that in the Maracaibo basin, which probably supported a large industry (Seijas, 1986). There has been no legal hunting of *C. crocodilus fuscus* in Venezuela since the ban was imposed in 1973. When hunting of the other subspecies was temporarily re-started in 1984 in the Llanos, no licences were granted for the north-western states in which *C. crocodilus fuscus* occurs (Quero de Pena, 1984). Some illegal hunting is known to occur, and official figures show that 616 caiman skins were confiscated in the Maracaibo region in 1982 (Seijas, 1986).

In very dry years populations in savannas may be reduced by as much as 80% because of mortality in small individuals. However, populations seem able to recuperate (Gorzula, cited by Groombridge, 1982). Many of man's impacts on the environment, in particular, the creation of reservoirs, and the digging of drainage ditches, seem to be mainly beneficial to *C. crocodilus* (Gorzula and Paolillo, 1986; Seijas, 1986). The region in which *C. crocodilus fuscus* occurs in Venezuela is the most heavily affected by urban and industrial development, the Maracaibo basin being the main oil-producing area. Some of the effects may be deleterious to caimans, but other impacts, in particular, the creation of reservoirs, and the digging of drainage ditches, seem to be mainly beneficial to *C. crocodilus*. The species also appears to have benefited from the removal of competition from *Crocodylus acutus*, whose populations have decreased (Seijas, 1986).

INTERNATIONAL TRADE *Caiman crocodilus* is the second most commonly exported species of reptile in South America, after *Tupinambis*. Caiman skin is traditionally considered inferior to classic crocodile skin, and levels of exploitation only rose after the supplies of the more valuable crocodilians became depleted. However its popularity is increasing, partially owing to improved tanning procedures, and it was reported to be replacing crocodile in the high-quality handbag and shoe market in the USA in 1985. Caiman products commanded the same prices as crocodile ones, wallets selling for US$60-180, shoes for US$475-600, and handbags from US$375 to over US$1000. Most of the caiman skin is *C. crocodilus yacare*. Artificial embossed crocodile leather was reported to be improving in quality, and fetching similar prices to the real item. This was thought to be associated with a rise in price of real skin, in turn dependent partially on its decreasing availability (Brazaitis, 1985). Caiman sides were reported to be worth about US$60 each in the USA (Hyman, 1985). French and Italian reptile leather dealers report falling demand for reptile skin products. Most of the *C. crocodilus fuscus* products available in Italy range from 17 cm to 35 cm belly width (Bodiopelli, *in litt.*, 4 March 1986).

Caiman crocodilus

Small numbers of live animals are traded, mainly as pets, but the quantities are insignificant in comparison with the skin trade.

There have been several reports published recently detailing the international trade in caiman skins (Anon., 1984; Hemley and Caldwell, 1986), using CITES and Customs statistics as sources of data. It is impossible to arrive at an accurate estimate of even the legal trade in caiman skin from CITES reports, because of the widely varying methods of reporting transactions. Most caiman hide is shipped as sides or flanks, as this is usually the only part to be used, but there are also some whole skins in trade. CITES reports contain reference to both skins and sides, but there is good evidence that the terms are used interchangably; sometimes it is possible to see that the importer has reported sides and the exporter skins for what is obviously the same transaction. Confusion is increased, as the quantity may be reported by number, weight, length or area; and finally the taxon may be described to species or subspecies level. There are thus at least 16 ways in which any shipment can be reported without giving any false information. Added to which, it often suits the unscrupulous trader to falsify the subspecies, either to conceal the true country of origin of the skins, or else to circumvent protective legislation, such as the USA Endangered Species Act. These factors all compound to make the analysis of CITES statistics difficult and potentially inaccurate. This should be borne in mind when considering the analysis presented in the following tables, but it is thought that they do give an indication of the order of magnitude of the trade. The CITES reports are summarised in Tables 1 and 2. As explained in the introduction, the analysis involves many potential systematic errors, but with caimans there is an additional error involving double reporting, where imports and exports were reported in different units, or where the terms "skins" and "sides" were confused. The actual trade may therefore be lower than the totals reflected in the tables.

Table 1a contains an analysis of the minimum net trade in skins and sides of all subspecies of *C. crocodilus*, including those reported as "*Caiman* spp." The total volume has fluctuated around a value of about three-quarters of a million. It peaked in 1985, at just over a million skins. The totals for 1980 to 1982 are all higher than those reported by Hemley and Caldwell (1986) partially owing to different analysis techniques and partially because more data have subsequently been added. However they are not unrealistically high, as it has been estimated that the number of caiman skins taken annually in southern Brazil, Bolivia and Paraguay exceeds one million (Hemley and Caldwell, 1986). The major net importing countries are the USA, Italy, F.R. Germany, France, Austria, Switzerland, Hong Kong and Japan. Japan had high gross imports in all years but also re-exported large quantities, with the result that it often appeared as a net exporter.

The composition of reported trade in different subspecies is shown in Table 1b. *C. crocodilus crocodilus* was traded in the largest numbers in all years except 1982 and 1983, when *C. crocodilus yacare* took precedence. *C. crocodilus fuscus* was mostly traded in low volumes except in 1980, 1984 and 1985, when figures of over 200 000 were reported, exceeding half a million in 1985. The relative numbers of the subspecies takes on greater importance when the countries of origin are considered.

The declared sources of the skins of *C. crocodilus crocodilus* are shown in Table 2a. Bolivia has been included under countries without wild populations as, although it may have a few of this subspecies in the north, it is not thought to have an exploitable population. Up to 1984, the main declared sources were Bolivia, Paraguay, Colombia and Panama, only one of which,

Colombia, can be correct. Only about 10-20% of the declared trade has been from countries having this subspecies in the wild. The apparent exports from Bolivia are comparable with the figures quoted by Hemley and Caldwell (1986) obtained from the Bolivian wildlife authority, which give exports of 85 551, 62 155 and 29 823 for 1982, 1983 and the first six months of 1984, respectively. It is thought that a large number of skins of *C. crocodilus yacare* are reported as *C. crocodilus crocodilus*. This subterfuge has been used to import skins to the USA, where the Yacare is protected by the Endangered Species Act, and some successful prosecutions have been brought against skin dealers (Brazaitis, in press). In 1984 and 1985, Guyana and Venezuela emerged as the major sources, the skins from the latter country coming from a newly introduced management programme.

The declared sources of the skins of *C. crocodilus fuscus* are shown in Table 2b. The majority apparently came from Colombia and Panama, although Honduras and El Salvador emerged as significant sources in 1984 and Guatemala appeared to export around 347 700 in 1985. All these countries do have wild populations of this subspecies but these levels of offtake seem excessive. In the case of Guatemala the total is over twenty times the estimated wild population, and the skins probably originated in other countries and were re-exported. Panama is known to be a major entrepot for wildlife trade originating in South America (Vallester, 1978).

The declared sources of the skins of *C. crocodilus yacare* are shown in Table 2c. The major sources were Paraguay and Argentina, although Panama and Colombia had significant exports in 1982 and 1984, and these, if correctly identified, must represent re-exports. The Yacare thus presents a different picture to the other subspecies: most of the skins are reported to come from possible source countries, and the reported levels of exploitation are not grossly inflated compared with probable wild population sizes. This does not imply that the Yacare is not being over-exploited, but merely that there is no incentive to falsify the reported countries of origin for skins declared as being *C. crocodilus yacare*. The total volume of trade in skins of this subspecies is probably far higher, as many of the skins are thought to have been incorrectly recorded as *C. crocodilus crocodilus*.

Two outstanding features of the trade in *C. crocodilus* are its size and the fact that the great majority of it is illegal. Since 1980, the only legal sources of skins in South America have been Venezuela (from 1983 to 1985), Colombia (only stocks held by two companies, prior to 1984), Bolivia (only *C. crocodilus yacare*, prior to 1985) and the Guianas. Small amounts of trade in *C. crocodilus fuscus* from Central America and Colombia may also be legal. The only mainland countries currently permitting commercial exports are El Salvador and the Guianas. Ignoring the illegal and undeclared trade, less than 20% of the declared trade in *C. crocodilus* up to 1984 was even potentially legal. Questions of whether the limits on trade set by the producing countries are within sustainable levels are therefore irrelevant, as the existing legislation was obviously being flouted by importers and exporters alike. In 1985, there have been some improvements, with a greater percentage of the trade apparently coming from the legal harvest in Venezuela, but some of the newly emerging trade routes, in particular Guatemala, Guyana and El Salvador, together with the continuing exports from Bolivia, Paraguay and Panama, give cause for concern.

Caiman crocodilus

Table 1a. Minimum net commercial imports of skins and sides of all subspecies of *Caiman crocodilus* reported to CITES (2 sides = 1 skin).

	1980	1981	1982	1983	1984	1985
Albania	–	200	–	–	–	–
Argentina	–	–	–	4103	–	–
Australia	–	–	3	972	–	–
	–	–	–	628 m^2	–	–
Austria	37029	47089	36567	20927	37534	35240
	–	167 m^2	72 m^2	355 m^2	562 m^2	557 m^2
	–	–	6 kg	–	–	3 m
	–	–	32 m	–	–	–
Belgium	1550	1488	441	156	–	2955
	–	–	5 m^2	–	–	–
Canada	5004	1316	685	651	4067	8329
	75 m^2	–	–	172 m^2	346 m^2	342 m^2
China	–	–	–	–	–	9 m^2
Costa Rica	–	–	4000	–	–	244 m
Demark	141	58	–	22	–	–
Egypt	–	681	1228	2101	–	–
Finland	232	–	200	115	–	117
France	94290	248900	1111	–	328336	137569
	–	769 m^2	110 m^2	1042 m^2	2604 m^2	41 m^2
	–	20460 kg	1934 m	–	–	–
Germany DR	–	–	–	2427	–	–
	–	–	–	146 m^2	–	–
Germany FR	211451	46074	128299	185024	–	14005
	197 m^2	112 m^2	–	788 m^2	417 m^2	19 m^2
	–	196 kg	–	–	–	–
	–	326 m	93 m	–	–	–
Greece	–	–	–	20	785	385
	–	–	–	–	23 m	–
Hong Kong	4158	6292	15665	13242	34356	10547
	356 m^2	664 m^2	630 m^2	3011 m^2	538 m^2	1429 m^2
	134 kg	1354 kg	353 kg	70 m	–	–
Ireland	–	–	4	–	–	–
Italy	358041	173868	322325	305087	151315	513803
	–	2269 m^2	987 m^2	–	–	2713 m^2
	–	16723 kg	8217 kg	6360 kg	423 kg	646 kg
Japan	36325	–	–	61884	153 m	94268
	–	–	127 kg	131518 kg	123846 kg	65797 kg
Kuwait	–	–	–	–	18	–
Lebanon	142	–	30	961	27	–
Luxembourg	12	–	10	2	–	–
Malaysia	–	–	–	–	122	–
Mexico	96	–	–	1 kg	–	–
Monaco	16	–	–	–	–	–
Morocco	–	–	–	–	–	86
Netherlands	18	9	–	367	15000	–
N. Antilles	–	–	–	–	2965	–
New Zealand	–	5	27	–	12	–
Portugal	210	446	60	–	–	–
	–	–	3 m^2	–	–	–

Table 1a continued.

	1980	1981	1982	1983	1984	1985
Qatar	-	-	-	12	-	-
Singapore	-	12382	-	1345	-	-
	-	25 kg	88 kg	344 m^2	-	-
S. Arabia	-	-	1343	41	4	27
S. Africa	3446	5471	6707	5274	3690	1039
	-	5 m^2	-	-	-	276 kg
S. Korea	-	-	-	2997	1788	1243
	-	-	-	154 m^2	87 m^2	241 m^2
Spain	-	9383	8470	4727	7658	1302
Sweden	1132	76	-	23	-	-
Switzerland	58868	123112	93610	47835	104173	103870
	2 m^2	43 m^2	6970 m^2	1386 m^2	40 m^2	-
	-	-	-	-	1 m	-
Syria	-	-	-	-	32	-
Taiwan	-	-	-	45	-	389 m^2
Thailand	-	-	-	26	-	-
Turkey	-	-	-	30	251	13
UK	-	919	-	2562	-	3491
	188 m^2	-	1022 m^2	6 m^2	-	511 m^2
	-	-	-	48 m	-	-
USA	26415	87102	53005	71901	10071	129643
	-	5 m^2	-	378 m^2	-	19 m^2
	5283 m	3514 m	1226 m	15 m	460 m	20 m
Uruguay	-	28 kg	-	-	50	-
	-	-	-	-	5 m^2	-
Yugoslavia	3629	-	54	-	20	46
Unknown	9	-	962	-	238	-
TOTAL	842214	764871	674803	734849	702512	1057978
	818 m^2	4034 m^2	9799 m^2	8410 m^2	4622 m^2	6270 m^2
	5283 m	3840 m	3285 m	133 m	636 m	267 m
	134 kg	38786 kg	8791 kg	137879 kg	124269 kg	66719 kg

Caiman crocodilus

Table 1b Minimum net trade in skins and sides of three subspecies of *C. crocodilus* (2 sides = 1 skin).

	1980	1981	1982	1983	1984	1985
C. c. crocodilus						
	555492	546189	209889	297372	436988	649730
	630 m^2	3224 m^2	2066 m^2	6976 m^2	2428 m^2	6267 m^2
	5283 m	3514 m	–	363 m	613 m	229 m
	134 kg	25429 kg	4793 kg	13168 kg	120981 kg	56065 kg
C. c. fuscus						
	277016	181738	98444	69609	206182	552202
	–	–	18 m^2	125 m^2	423 kg	10654 kg
	–	326 m	93 m	–	23 m	264 m
C. c. yacare						
	19320	138358	385307	392826	89032	32703
	–	108 m^2	401 m^2	601 m^2	2086 m^2	3 m
	–	11085 kg	3785 kg	6052 kg	1432 m	

Table 2a Reported countries of origin or export for commercial exports of skins and sides of *C. crocodilus crocodilus* reported to CITES (2 sides = 1 skin).

	1980	1981	1982	1983	1984	1985
Countries with wild or farmed populations of *C. crocodilus crocodilus*						
Brazil	–	–	–	–	835	–
Colombia	104495	71414	35254	132809	144127	78166
	–	155 m^2	111 m^2	1488 m^2	1466 m^2	1832 m^2
	–	1363 kg	4231 kg	–	1550 kg	922 kg
F. Guiana	6307	8804	1230	3793	945	1379
	276 m^2	83 kg	116 m^2	85 m^2	–	–
	103 kg	–	88 kg	–	–	–
Guyana	–	12	325	90	77191	121340
	–	108 kg	–	–	–	–
Peru	93 m^2	3000	6201	2	–	–
	–	–	102 m^2	186 m^2	–	–
Suriname	–	–	–	39	–	–
Taiwan	–	–	–	–	152 m	–
Venezuela	44554	–	–	800	3226	270424
	–	–	–	–	455 m	3981 m^2

Table 2a continued

	1980	1981	1982	1983	1984	1985
Countries without wild populations of *C. crocodilus crocodilus*						
Argentina	4659	10516	-	-	1568	-
	-	75 m^2	-	-	-	-
Bolivia	164666	106530	102067	62574	31326	162733
	139 m^2	2313 m^2	1223 m^2	772 m^2	-	367 m^2
	31 kg	21634 kg	533 kg	560 kg	-	6626 kg
	-	-	-	48 m	-	-
Canada	4	3	4	1	-	-
El Salvador	-	-	-	-	5253	15042
France	26206	46645	4413	28	-	-
	75 m^2	-	-	-	-	-
Germany, F.R.	6958	7305	31	-	-	-
	2 m^2	-	-	-	-	-
Haiti	4747	-	-	55	175	-
Indonesia	625	298	-	52 m^2	-	-
Italy	13022	19905	-	300	-	-
Japan	-	-	-	-	-	1940
Madagascar	8	-	-	-	-	-
Netherlands	498	-	-	-	-	-
N. Antilles	1	719 kg	450	4	-	-
Nicaragua	-	-	-	-	1	-
Panama	59161	7246	7063	34582	88	-
	-	-	-	4750 kg	2085 kg	-
Paraguay	239498	379619	56319	49808	169609	7424
	-	962 m^2	130 m^2	108 m^2	95 m^2	91 m^2
	-	14 m	-	230 m	1 m	-
	-	2910 kg	-	123444 kg	114374 kg	48389 kg
Singapore	-	12	-	-	-	-
S. Africa	-	-	-	-	28	-
Switzerland	-	89	-	-	1076	-
UK	88	1262	412	5151	-	154
	2 m^2	-	-	-	-	-
	21 m	-	-	-	-	-
USA	8948	-	1	3200	-	-
	-	-	47 m^2	-	-	-
Unknown	66270	39796	16456	59966	6307	288366
	46 m^2	106 m^2	411 m^2	4298 m^2	873 m^2	231 m
	5263 m	3500 m	-	85 m	-	-
	-	-	-	3195 kg	2972 kg	-

Caiman crocodilus

Table 2b. Reported countries of origin or export for commercial exports of skins and sides of *C. crocodilus fuscus* reported to CITES (2 sides = 1 skin).

	1980	1981	1982	1983	1984	1985
Countries with wild or farmed populations of *C. crocodilus fuscus*						
Colombia	161170	45968	19788	38253	8958	8746
Costa Rica	-	-	-	12	-	-
El Salvador	-	-	-	2479	79389	121835
	-	-	-	-	423 kg	10654 kg
Guatemala	-	-	-	-	-	347700
Honduras	-	-	-	-	55484	36524
Mexico	-	-	-	-	1	-
Nicaragua	-	-	-	-	-	264 m
Panama	176150	130905	88985	59646	10062	23845
	-	-	-	-	23 m	-
Countries without wild or farmed populations of *C. crocodilus fuscus*						
Argentina	100	-	-	435	-	-
Bolivia	1488	-	4	195 m^2	-	-
France	-	-	-	-	-	4135
Fr. Guiana	-	-	19 m^2	-	-	-
Germany, F.R.	-	-	-	6 m^2	-	-
Haiti	-	3501	-	-	-	-
Indonesia	-	500	-	-	-	-
Italy	3723	1255	-	-	-	-
Paraguay	16135	760	100	962	1090	2976
Spain	-	-	-	-	-	4
S. Africa	-	-	-	-	1	-
Thailand	-	-	-	3	-	-
USA	-	402	-	-	-	-
Unknown	1584	100	3086	4665	66747	4
	-	326 m	93 m	-	-	20 m

Table 2c. Reported countries of origin or export for commercial exports of skins and sides of *C. crocodilus yacare* reported to CITES (2 sides = 1 skin).

	1980	1981	1982	1983	1984	1985
Countries with wild or farmed populations of *C. crocodilus yacare*						
Argentina	13073	36874	15585	7827	10861	1200
Bolivia	-	-	602	3919	-	-
Brazil	4	-	-	-	-	-
Paraguay	4833	131094	333933	416427	70926	27747
	-	112 m^2	379 m^2	18 m^2	2014 m^2	3 m
	-	11085 kg	3779 kg	6052 kg	2865 kg	
Countries without wild or farmed populations of *C. crocodilus yacare*						
Colombia	-	-	-	1234	11208	3756
Ecuador	-	1	-	-	-	-
France	1678	651	-	-	-	-
Fr. Guiana	-	-	-	1328	-	-
Italy	660	8574	-	-	-	-
Panama	-	-	46316	3626	342	32
Unknown	721	4338	1492	23086	3	233
	-	-	6 kg	620 m^2	139 m^2	-

CONSERVATION MEASURES The legal protection status of *C. crocodilus* is summarised in Table 3. A discussion of the legislation is given below as it is so complicated in many countries. Unless otherwise stated all information was from Fuller *et al.* (1987).

It has been suggested (Brazaitis, cited in Groombridge, 1982) that *C. crocodilus fuscus* subspecies should be upgraded from Appendix II to Appendix I of CITES. However, this may be premature until studies have be made to determine the status of Venezuelan populations, as well as those in the various Central American countries.

C. crocodilus yacare is specifically listed on the USA Endangered Species Act, which prevents the import of this taxon to the USA.

A major requirement is to limit smuggling by proper enforcement of existing laws. It has been proposed by some that *C. crocodilus yacare* should be upgraded from Appendix II to Appendix I of CITES, at least until adequate studies have been completed, evaluating the status of populations and the effect of hunting on their reproductive potential. This proposal is not endorsed by all authorities. There appear to be good populations still in parts of Bolivia, Brazil and Paraguay. Present uncertainty about the taxonomic status and distribution of Yacare, in particular in relation to the remainder of the '*Caiman crocodilus* complex', should be resolved when the current research project has been completed.

Argentina *C. crocodilus yacare* is designated as a protected species under Ley 22.421, Art. 7, and is protected by a total ban on commercial hunting, import and export in Argentina. Although the implementing legislation was enacted in 1981, the ban did not become effective until 1983. The export of raw hides has been banned since 1976 (Resolucion No. 134).

Bolivia Decreto Supremo No. 16605 (June 1979) prohibits the hunting and trade in species of native wildlife listed as protected, except that trade in captive-bred specimens is permitted. *C. crocodilus* is included in the protected list, however there is official disagreement over the validity of this decree, and it has largely been disregarded. A temporary ban on the export of live animals was imposed from May 1984 until August 1985, when it was extended to July 1986 and expanded to cover wildlife products as well. Decreto Supremo No. 21312 of June 27 1986 extended the ban on the export of all wildlife products for three years with the sole exception of an annual quota of 50 000 skins of *C. crocodilus*, all of which must be tanned before export.

Brazil Complete protection is afforded the species in Brazil (Decreto Presidential No. 58.054, 23 Mar 1966; Decreto-Lei No. 289, Feb 1967).

Colombia From 1982 until 1984, only inventoried stocks of hides were permitted (from 1983 onwards this included only two companies), but all further exports were banned from November 1984. Under Resolucion No. 847 (August, 1973), hunting and trade of *Caiman crocodilus* is prohibited in the Orinoco basin, except for subsistence purposes, and is banned along the Atlantic coast from April to July. A minimum size limit of 1.5 m is in force. Only tanned skins were allowed to be exported (Resolucion No. 16, October 1969), but even this has now been prohibited.

Costa Rica Commercial trade and exports of non-marine wildlife has been prohibited since 1970. All hunting of endangered species (including *C. crocodilus*) was prohibited in 1985 (Decreto No. 15895-MAG).

Caiman crocodilus

Ecuador No commercial exports of indigenous wildlife are permitted.

El Salvador There are no protective laws for the species in El Salvador other than those resulting from membership of CITES.

French Guiana *C. crocodilus* is listed under Article 3 of Arrêté of 15 May 1986, which prohibits their use, taxidermy, purchase or sale. Their transport is permitted only if they have been legally acquired outside the territory.

Guatemala In response to queries from the CITES Secretariat about the large numbers of caiman skins exported early in 1985, a total prohibition on hunting, capture, local trade, export and re-export was imposed by Resolucion No. 410-86, 23 June, 1986.

Guyana All exports were prohibited on 28 February 1987. The ban was lifted on 1 October 1987 and an export quota system was introduced. An annual export quota of 20 000 live *C. c. crocodilus* and 40 000 skins was proposed for 1987 and 1988.

Mexico Annual closed seasons are imposed for *C. crocodilus*, and there is a minimum size limit of 1.5 m (Flores Villela, 1980). Exports of live animals and parts and derivatives have been prohibited since 1982.

Nicaragua Commercial hunting and export of wildlife has been prohibited since 1977 (Decreto No. 625), but non-commercial tourist exports of up to two objects made from *C. crocodilus* are permitted. The species is not listed as endangered, and hunting seasons may be restricted.

Panama The capture, hunting, sale or export of endangered species (including *C. crocodilus*) has been prohibited since 1980 (Resolucion No. 002-80). There are few regulations covering the import and re-export of wildlife and their products.

Paraguay All hunting, trade and exports of indigenous wildlife has been prohibited since 1975 (Decreto No. 18.796). There was confusion over whether the law still applied after the ratification of CITES in 1977 but it has now been confirmed, and no export permits have been issued since 1982.

Peru *C. crocodilus* only occurs in the Amazonian lowlands (Selva region), and under Decreto Supremo No. 934-73-AG (October 1973), no trade in species from this area is permitted, except for animals hunted for subsistence purposes. Caiman are not on the list of huntable species.

Suriname There are no protective laws for the species in Suriname.

Trinidad and Tobago The species is protected in Trinidad (Ordinance No. 26, Page 13, 1958).

Venezuela *C. crocodilus* is listed as a game species in Venezuela, but exports were prohibited from 1974 until 1983. Experimental harvest quotas were set in 1983, but these were suspended in 1985 Exports were prohibited for one year by Resolucion No. 61, 23 October 1985. When this expired, a new quota system was introduced, the quota for 1987 being set at 150 000 animals. Hunting is only authorised in the states of Apure, Barinas, Cojedes and Portuguesa Region (Venezuela CITES MA, 1987).

Table 3. Legal prohibition on the commercial hunting, internal trade and commercial export of *C. crocodilus*. Dates are those on which the legislation came into force. A - All live animals & parts; L - Live animals only; S - Semi-finished or finished skins allowed; P - Allowed under permit under special circumstances; C - Closed seasons or quotas may be imposed; B - Animals and parts from captive-breeding facilities allowed; * - these territories are Overseas Départements of France with which the EEC may trade without the imposition of CITES controls; ? - no information. Note *C. crocodilus apaporiensis*, which is on CITES Appendix I, occurs within Colombia, where it is accorded full protection (Fuller *et al.*, 1987 modified by G. Hemeley *in litt.* 1987).

	CITES	Hunting	Trade	Export
Argentina	1981	A 1983	A 1983	A 1983
Bolivia	1979	A 1986	A 1986	B 1979/ S/P/C 1986
Brazil	1975	A 1967	A/B 1967	A/B 1967
Colombia	1981	A 1983	B/P 1978	B/S/P/C 1974
Costa Rica	1975	A 1983	A/B 1983	A/B 1984
Cuba	-	?	?	?
Ecuador	1975	C	P	A 1981
El Salvador	1987	-	-	P 1985
Fr. Guiana	1978 *	A 1986	A 1986	A 1986
Guatemala	1980	A 1986	A 1986	A 1986
Guyana	1977	-	-	A 1986/C 1987
Honduras	1985	-	-	-
Mexico	-	C 1951	-	A/B 1982
Nicaragua	1977	A 1977	P 1979	A 1977
Panama	1978	A 1980	A 1980	A 1980
Paraguay	1977	A 1975	A 1975	A 1975
Peru	1975	C 1973	A 1973	A 1973
Puerto Rico	1975	?	?	P
Suriname	1981	-	-	P
Trinidad & Tobago	1984	A 1958	A 1958	A 1958
Venezuela	1978	C 1982	P 1982	S/P/C 1982

CAPTIVE BREEDING *C. crocodilus* is kept in a large number of zoological collections and breeds regularly. There are aslo several farming operations orientated towards the commercial production of caimans for skins; these are summarised below. Many of these farms keep crocodilians primarily as a tourist attraction, and others are orientated more towards research. There are currently none which derive most of their income from skin sales, and Magnusson (1984) has suggested that this may not be possible, owing to the low value of *C. crocodilus* hides. The largest commercial operations for *C. crocodilus* exist in Taiwan, and these depend mainly on the sale meat and medicinal products.

Bolivia ASICUSA (Asociacion de Curtidones de Cueros de Saurios), based in Cochabamba and comprising four companies, Tomy, Alligator, Dorado and Moxos, all involved in the tanning and processing of caiman skins in Bolivia, was reported in 1982 to be establishing a crocodilian farm in Bolivia. In 1983 it was claimed that the stock included 2000 crocodilians comprising *C. crocodilus crocodilus, C. crocodilus yacare, Melanosuchus niger* and "another species of *Caiman*". However Quaino, Director of "Moxos" Alligator

Ranch, stated that his ranch was only in a very preliminary phase and contained only *C. crocodilus* in 1983. It is extremely unlikely that any breeding has taken place on any farm in Bolivia. A report in 1982 stated categorically that no breeding had occurred at that stage (Luxmoore, *et al.*, 1985).

Brazil No commercial crocodilian farming has taken place in Brazil but IBDF (Instituto Brasileiro de Desenvolvimento Florestal) has initiated some experimental farming of *C. crocodilus*. One breeding centre operated by IBDF outside Manaus, the Centro Experimental de Criaçao em Cativeiro de Animais Nativos de Interêsse Cientifico e Econômico (CECAN), formerly held small numbers of *C. crocodilus* and *Paleosuchus trigonatus* but these have since been disposed of.

An experimental farm for *C. crocodilus yacare* was set up in 1981 in the Pantanal about 150 km from Pocone, Mato Grosso. The aim of the project, managed by IBDF, is to evaluate the possibility of caiman ranching in the Pantanal. Eggs are collected from the wild, incubated and hatchlings are to be released later. Few results are available as yet (Luxmoore *et al.*, 1985). Several cattle farmers in the Pantanal have expressed an interest in caiman farming, and two are reported to have started farms (Brazaitis, 1985).

Colombia No commercial crocodilian breeding operations exist in Colombia, but there are two (formerly three) breeding centres for conservation or scientific purposes. One of these, the Estacion de Biologia Tropical at Villavicencio, kept 17 *C. crocodilus* in 1983. Another, at Cienaga Grande, formerly kept *C. crocodilus fuscus*, but this is believed to have closed (Luxmoore *et al.*, 1985).

Costa Rica A commercial farm was set up in the country in 1984 by a commercial company acting in conjunction with the Ministerio de Agricultura y Ganadaria. They had a stock of 96 *C. crocodilus*, mostly yearlings in 1985 (Luxmoore *et al.*, 1985; Anon., 1985).

Honduras It was reported that a commercial farm for *C. crocodilus* was under consideration in 1985 (Anon., 1985).

Italy Only one crocodilian farm is reported to have operated in Italy, but it is now thought to have closed down. In 1981 it held a stock of 406 caimans, probably *C. crocodilus*, originating in Colombia (Luxmoore *et al.*, 1985).

Suriname There was reported to be a caiman farm in the Saramanca district in 1979 (Luxmoore *et al.*, 1985), but the farm never materialised, being merely used as a cover for a commercial hunting operation (M.S. Hoogmoed, *in litt.*, 26 August 1986).

Taiwan There are 35 crocodilian farms in Taiwan, the first of which was established in 1976. The bulk of the stock is *C. crocodilus*, of which about 8000 were kept in 1984. The annual production from all farms in 1984 was 12.5 t of skins, 30 t of meat and 7.5 t of other products, worth a total of around NT$30 million (US$1 = NT$39). Most of this is sold within Taiwan but some is exported to Japan and Korea. The meat is sold for food rather than medicinal use, except those parts of the skeleton, blood, and male genitalia which have medicinal value. The skin is processed for leather manufacture. About 2000 hatchlings are produced each year on the farms. Each mature female lays about 25-45 eggs with a hatching rate of 45% (Luxmoore *et al.*, 1985).

Thailand The Samutprakan Crocodile Farm, which stocks mainly *Crocodylus siamensis* and *Crocodylus porosus*, also had about 225 *C. crocodilus* in 1984 (Luxmoore *et al.*, 1985).

Venezuela The Ministerio del Ambiente y los Recursos Naturales Renovables (MARNR) runs an experimental centre to investigate techniques of captive rearing of crocodilians, mainly *C. crocodilus*. Two private ranches in the Llanos region, Hato Masaguaral and Hato El Frio, have been keeping *Crocodylus intermedius* and have begun experiments on collecting and incubating eggs of *C. crocodilus*, to evaluate the effect of releasing juveniles on the potential harvest of the wild population (Luxmoore *et al.*, 1985).

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NEW GUINEA CROCODILE

Recommended list: 3
[No problem*]

Crocodylus novaeguineae Schmidt, 1928

Order CROCODYLIA

Family CROCODYLIDAE

*Note last paragraph Summary and Conclusions

SUMMARY AND CONCLUSIONS A small to moderate size crocodilian, occurring mainly in freshwater habitats, almost restricted to the island of New Guinea (Papua New Guinea and Irian Jaya). Intense exploitation for hides, at a peak in the 1960s, has led to widespread depletion of populations, but adequate populations are known or thought to persist in both Irian Jaya and Papua New Guinea, mainly in remote and poorly accessible lowland grass swamps. Difficult terrain and secretive habits inhibit reliable estimation of population size or location but may also hinder exploitation. Remains largely submerged in water during daylight, rarely basks, emerges at night. Feeds mainly on fish and waterfowl, also other small vertebrates. Sexual maturity in females generally attained at 1.8–2 m, age 6–8 years (possibly up to 10 years in the wild), and 2.5 m, age uncertain, in males. A 1.7 m wild female, belly width 34 cm, has been recorded with 30 eggs. A mound-nesting species, females guard nest. Mean clutch size in northern PNG 35, in southern PNG 22; eggs of southern females tend to be larger, to 77 cm and 97 g. Females and males may excavate nest, assist hatchlings to water, and females associate with own hatchlings.

Hide hunting and collection of young to stock rearing farms are present threats to survival. Few protected areas exist. In Papua New Guinea a project developed with FAO/UNDP assistance exports ranched hides. The initial emphasis on village 'farms' has now given way to ranching in a small number of larger commercial establishments, using stock collected by villagers from the wild. The effect on wild populations is unknown in full, but early results of the PNG monitoring scheme indicate a small but steady rise in nesting numbers in the survey area (Sepik River). In this area at least, a continued harvest of young crocodiles has been compatible with survival of a healthy crocodile population, given that breeding adults and nests are adequately protected. Present legal size range of skins is 7–20 inch belly width; the upper limit should be decreased to provide more complete protection of the smaller breeders. Rearing projects, similar to the PNG model, are to be promoted in Irian Jaya, where numbers of *novaeguineae* appear to be adequate. Large numbers of skins of this species have appeared in trade reported to CITES in recent years: extremes of 5812 and 25 304 between 1980 and 1985, with a mean of 16 746, from PNG and 1455–17 319, mean 7079, from Indonesia. The PNG figures, derived from reported imports, do not correspond well with export numbers reported by PNG itself, which are rather higher. Similarly, with the exception of 1985, the Indonesian figures are not thought to reflect the true volume of exports.

There seems no doubt that this species is able to sustain a substantial trade, based on ranching of wild caught young and controlled harvest of sub-adults, provided that protection of breeding adults and of nests is rigorously enforced. There are indications that the control of trade in Indonesia is not adequate and there have been substantial illegal exports. However a new FAO programme has been initiated which aims to manage the harvest and regulate the trade. It is too early to say if this is working.

DISTRIBUTION Virtually restricted to the island of New Guinea (Papua New Guinea and Irian Jaya) (Neill, 1971; Hollands, 1987; Whitaker *et al.*, 1985).

The freshwater crocodile in New Guinea was originally described as a full species (Schmidt, 1928), but several authors have treated this form and the freshwater crocodile in the Philippines as two subspecies of one species, *C. n. novaeguineae* and *C. n. mindorensis* respectively. A recent tendency is to regard the Philippines crocodile as a full species *C. mindorensis*, in which case the New Guinea form also reverts to a monotypic species *C. novaeguineae* (Wermuth and Mertens, 1977). A significant number of differences exist - in cranial osteology, scalation, and aspects of reproductive biology - between populations north and south of the central highlands in Papua New Guinea (Hollands, 1987, and references therein). A case could be made for regarding these population groups as separate species (Cox, 1984; Hollands, 1987 and sources cited therein).

Indonesia Seemingly widespread in Irian Jaya, extending from the border with Papua New Guinea westward to the Kepala Burung (Vogelkop) region (Whitaker *et al.*, 1985). This species retains significant populations in large tracts of swamp country, especially when deep inland or otherwise remote; some 40 000 sq km of such habitat occurs in Irian Jaya, concentrated in the southern lowlands (from Merauke to Timuka), the Mamberamo and its tributaries in the Meervlakte region (north of the central highlands), and the southern section of the Kepala Burung (Whitaker *et al.*, 1985).

Papua New Guinea Widespread in areas of suitable freshwater habitat both north and south of the central highlands, extending from the border with Irian Jaya eastward to the vicinity of Robinson River near Abau (Central Province), almost at the eastern tip of the island. Absent from the island provinces of Papua New Guinea (Whitaker, 1980).

POPULATION Overall, populations of *C. novaeguineae* appear to be widely depleted to some extent, severely depleted in places, but adequate densities are retained in parts of both Irian Jaya and Papua New Guinea. The difficult terrain and secretive habits inhibit accurate estimation of population status, but regular aerial surveys in selected areas of the Sepik system from 1981 to date - a component of the crocodile management project in PNG - have now provided the foundation for essential long-term monitoring, using nest numbers as an indicator of population trends (Hollands, 1984, 1985).

Indonesia Although populations of both crocodilians in Irian Jaya (*C. novaeguineae* and *C. porosus*) are reported significantly reduced from primordial levels due to excessive hide-hunting, "stable populations" or "considerable numbers" of *novaeguineae* remain in large tracts of remote or poorly accessible swamp country (Whitaker *et al.*, 1985). Given the great extent of such potential habitat available, Irian Jaya has been estimated to possess the carrying capacity for several hundred thousand crocodiles (Whitaker *et al.*, 1985). A recent survey recorded only 0.27 crocodiles per kilometre of the 847 km of river covered; about 4% of the total of 226 crocodiles were *C. porosus*, the rest, *C. novaeguineae*. (Whitaker *et al.*, 1985). These same consultants give a conservative estimate, based on their survey results and on habitat availability, that 7 000-10 000 small *novaeguineae* could be collected annually in Irian Jaya to form the basis for the establishment of a sustainable crocodile industry along the lines of the PNG model. Another study, carried out by the Forestry District Office, Irian Jaya, and the Faculty of Forestry, Bogor, (Anon., 1986) concluded that the population of crocodiles (both *C. porosus* and *C. novaeguineae*) in Irian Jaya was 2 596 808, based on sample surveys in a few localities. These estimates were thrown into doubt by Cox (1987), who extrapolated the

population density estimates from Papua New Guinea to the amount of available habitat in Irian Jaya and concluded that a better estimate for the latter country would be 350 000 *C. novaeguineae* and 63 000 *C. porosus*.

Papua New Guinea Aerial surveys of selected nesting areas along the Sepik, yielding data from which a nesting index is calculated, suggest a 38% increase in *novaeguineae* numbers between 1981 and 1983 (Hollands, 1984). The Sepik region produces nearly 40% of the country's skin crop, and, since the situation here is considered likely to be representative of the overall national picture, it was concluded in 1984 that the current crocodile management and exploitation regime is not only not causing further depletion of wild stocks, but is allowing significant population recovery (Hollands, 1984). The last survey incorporated in the above summary was carried out during the high-water phase in March 1984 but *novaeguineae* nesting is at a peak during low-water, in October/November; a subsequent survey at this time in the same year suggested a substantial reduction from the 1983 level to a little below that recorded for 1981 (Hollands, 1984, Annex 1). The latest survey for which results are available was carried out in October 1985. This indicates a substantial rise in nesting activity, to a level above that in 1983, and 43% above that recorded at the start of the monitoring programme in 1981 (Hollands, 1984, Supplement dated November 1985). It was concluded at the end of 1985 that rainfall and water level patterns were not conducive to nesting during 1984, and that the *novaeguineae* population in the Sepik area is continuing to rise steadily (Hollands, 1984, Supplement dated November 1985).

The report cited above highlights the case of Kamiemu as demonstrating the best aspects of the PNG cropping programme; here, some 3.5 sq. km of floating mat vegetation enclosed within an overgrown oxbow loop supports markedly increased nesting by *novaeguineae*, up to 27 nests in 1985 (Table 1 in Supplement). At this site both nests and breeding adult crocodiles are protected but a good number of young are harvested by local inhabitants to be sold to commercial crocodile farms. In contrast, at another site, nesting numbers continue to fall, mainly due to hunters killing adults for meat and taking skins (Hollands, 1984, Supplement dated 1985).

Population data of comparable quality are not available for other parts of PNG. In general, good numbers are said to remain in large tracts of inland grassy swamp, especially in more remote areas (Downes, 1971; Whitaker, 1980). The upper and middle Strickland River, with up to 2.23 crocodiles/km of river, primarily adults and subadults, may remain at historic population levels (Montague, 1981). Populations have been locally overhunted (Downes, 1971; Whitaker, 1980), with severe decline noted, for example, in Fly and Sepik River populations, and Lake Murray (Neill, 1971). Recent surveys in the Sepik region (see above) now suggest significant population recovery (Hollands, 1984). There is some evidence for slight recovery of *novaeguineae* in Lake Murray and the Fly River, due in the former to Government releases (10 adults in 1980) and escapes from the Baboa crocodile station, and in the latter to reduced hunting pressure (Montague, 1981, 1982a). Crocodile density is still (1978-1980) only 0.18 crocodiles/km on Lake Murray, and 1.8, 0.35, on the lower and middle Fly (Montague, 1981). In Papua New Guinea a density of 2 or more crocodiles/km appears indicative of healthy crocodile populations (Montague, 1981). It has been suggested that crocodile hunting should be banned on rivers with a density index of under 0.5 (Montague, 1981). A survey of navigable portions of the Purari River revealed a low density of crocodiles, subject to substantial exploitation; hunters interviewed suggested that the population had declined in the last decade (Pernetta and Burgin, 1980). However, significant numbers of *novaeguineae* may exist undetected in large areas of grass swamp connected by creeks to the main river. It was suggested by local hunters that crocodiles move into remote swamps during the

breeding season and only appear in more accessible river channels as water levels in the swamps decline (Pernetta and Burgin, 1980). It has been stressed that although hunting pressure may be less in remote grass swamps, it is probably never negligible, due mainly to the versatility of native canoes (Pernetta, 1982). In the Lake Murray area, low water surveys of 1302 km resulted in a count of 1112 crocodiles, probably indicating about 1765 actually present. Yet in 1980 alone, 2002 young live crocodiles (including 1.1% *C. porosus*) and 1100 skins were taken out of the area; it is considered that the permanent swamps adjacent to main navigable areas provided the additional crocodiles (Montague, 1981).

HABITAT AND ECOLOGY A relatively small crocodilian, average adult size 1.8–2 m (Brazaitis, 1973), maximum male length possibly around 3.5 m (Whitaker, 1980), maximum actually recorded 3.35 m (Montague, 1982a). Mainly occurs in freshwater habitats, but sometimes in brackish areas (Brazaitis, 1973), for example near the mouth of the Fly River (source in Whitaker, 1980). Primarily a lowland species, maximum known elevation is August River (West Sepik) c 600 m above sea level (source in Whitaker, 1980).

Most remaining good populations appear to occur in remote areas of extensive grass-swamp (Downes, 1971; Whitaker, 1980; Whitaker *et al.*, 1985). The New Guinea crocodile was formerly abundant, for example, in Lake Murray, a vast shallow lake basin, with highly indented shoreline and forested islands, the surroundings with rain forest, *Melaleuca* swamp and sago (Neill, 1971). In Waigani Swamp, the species was reported to avoid deep open water of the larger lakes, and prefer deep slow-flowing channels and small lakes overgrown with herbaceous aquatics (Neill, 1971).

Generally very secretive in habits. Juveniles, in particular, disperse into flooded swamplands during high water, possibly in response to harassment by larger individuals (Montague, 1981). Smaller crocodiles rarely enter the midstream of rivers but prefer near-shore cover such as emergent vegetation, overhanging branches and fallen trees (Montague, 1981). Captive individuals (at Moitaka Crocodile Farm, PNG) would emerge to bask in direct sunlight only occasionally, usually during periods of cool rainy weather. Most of the daylight hours were spent submerged or with only the head at the water surface. The crocodiles would emerge in late afternoon and remain out of the water all night and into the early morning. Body temperature was typically close to 30°C during daytime. The major behavioural pattern involved heat avoidance rather than heat gain (Lang, 1980a). Similar behaviour is recorded in wild populations (Neill, 1971). In Papua New Guinea about 12 times as many *C. novaeguineae* could be found on land at night than in day time (Montague, 1981, 1982a).

An opportunistic feeder, the known diet includes waterfowl such as crakes, rails and grebes (Neill, 1971; Whittaker, 1980) but fish are thought to be the main food (Montague, 1982a). Stomach contents of a 135 cm *novaeguineae* included a 60 cm watersnake *Amphiesma mairii*, a rallid bird, grasshoppers, leaves, and 40 gm of pebbles (Whitaker, 1980). Presumably small mammals are also taken. Hatchlings feed on invertebrates such as mosquitos, grasshoppers and water bugs (source in Burgin, 1980b).

Sexual maturity may generally be attained in females at 1.8–2 m, age 6 to 8 years, and 2.0–2.5 m, age uncertain, in males (Lang, 1981). Females estimated at 1.5 m total length have been observed guarding nests in Waigani Swamp (Neill, 1946), and a female of 34 cm belly width, 1.7 m length, was found to contain 30 eggs (Jelden, 1981). First breeding in the wild may typically occur at around 10 years of age in both sexes (Montague, 1982a). It should be noted that the PNG legislation prohibiting trade in skins over 20" (51 cm) belly width exposes young breeding females to legal hunting mortality for 1–2

years until this size is attained (Montague, 1982b). A near 1:1 sex ratio was found in a sample of 2031 wild *novaeguineae* from the Fly River (Montague, 1982b).

At Moitaka (PNG) courtship begins with the first rains, egg deposition follows after 4-8 weeks. The northern populations in Papua New Guinea nest during a rather short period in the dry season between August and November, hatching occurs as water levels increase; in dry zones of the south, nesting occurs at the start of the wet season, between Auguat and May, but with a peak in the middle of the wet season (Hollands, 1987; Cox, 1984). This timing may reflect hatchling requirements for increased vegetative cover and food supply (Whitaker, 1980). In a captive group (Moitaka Crocodile Farm, PNG) it appears likely that territorial behaviour and operation of a well-defined social hiearchy occur all year round, not only during the breeding season when most observations have been made (Lang, 1980a). However, individuals of the species appear more tolerant of conspecifics than individuals of *C. porosus* (Lang, 1980a).

In the Sepik River region, nearly 90% of nesting takes place amid floating vegetation mats involving various plant associations. Most of these nests are placed either in the flooded parts of 'scroll' zones (areas of parallel curved ridges and gulleys formed by sequential erosion and deposition at river bends) or in floating vegetation fringing open lakes and lagoons, and in vegetated oxbow lakes (Cox, 1984). Land nests are more frequent in southern Papua New Guinea where floating mat vegetation is less widespread (Cox, 1984). Both the general site and the nest itself are often reused from year to year. The nest is constructed of a mound of vegetable debris derived from plants at the nest site; mean length, width and height for floating nests in the Sepik region were 153, 131 and 50 cm, respectively (Cox, 1984). Mean clutch size in northern populations is 35; 22 in southern populations. Mean egg length and weight is 70 cm and 77 g, and 77 cm, 97 g, respectively. Northern animals thus lay more, but smaller eggs.

THREATS TO SURVIVAL The primary factor leading to depletion of *C. novaeguineae* populations over the past few decades has been over-hunting for skins. Collection of eggs for food is also widespread (Downes, 1971; Jelden, 1981). Present evidence from PNG indicates that harvesting of young can be compatible with survival and even recovery of *novaeguineae* populations providing that killing of breeding adults and nest predation are curtailed.

In Papua New Guinea the two indigenous crocodilians, *C. porosus* and *C. novaeguineae*, are utilized in a management scheme developed with the assistance of FAO/UNDP. It is argued that since there is a very high mortality of hatchling crocodiles in the wild, a harvestable surplus exists that could be taken and reared to commercial size in captivity, without affecting the status of wild populations. Rearing stations were mainly village-based and owned by local people and it was intended that rational management instead of indiscriminate hunting would be of long-term economic benefit. By the end of 1979 over 200 village crocodile-rearing stations were established (Kwapena and Bolton, 1980). However, only about 15% of the 'farms' were rearing crocodiles satisfactorily, due to lack of expertise in animal husbandry, seasonal fluctuations in water, difficulty in obtaining crocodile food, and other factors (Kwapena and Bolton, 1980). The emphasis now is on collecting of young crocodiles for sale to the three large-scale commercial farms. It has been suggested that this buying scheme has increased hunting pressure on wild populations (Burgin, 1980a). It has also been argued (Burgin, 1980a) that the basic assumption, that there is a very high density-dependent hatchling mortality, may only apply to populations at the carrying capacity of the environment. Density-dependant mortality would be

expected to be lower in populations already depleted by exploitation. The effect of the rearing programme on wild populations is uncertain although results of the monitoring programme (see 'Population', above) are very promising (Hollands, 1984, 1987). The PNG programme can not be considered a confirmed success until it is demonstrated that exploitation is being limited to a level consistent with long-term survival of the resource, but, despite valid reservations, the PNG project appears to constitute the closest approach yet achieved toward rational utlization of any crocodilian resource. It is claimed that the scheme not only maintains rural economies and counters urban drift, but also conserves wild crocodile populations since the hatchlings collected are considered a harvestable surplus and recruitment into the breeding segment, itself untouched, is able to continue. Full scale FAO/UNDP involvement ended in 1981 (except for persons assisting with monitoring).

A similar pattern of trade in the 1950s and 1960s is reported in Irian Jaya (Lever, 1980b). Hunting for the skin trade is the main factor affecting crocodile populations in Indonesia and collection of young for rearing appears to be on a smaller scale at present. Hunting in Irian Jaya is often organised by Chinese traders using transmigrants from Java or Sulawesi to liase with villagers who perform the actual hunting (Lever, 1980a). In 1972-1973 on the Eilanden River, Indonesian soldiers based at Agats were hide hunting and organising local people into hunting parties (Webb, 1981). Reportedly thousands of juvenile crocodiles (proportion of *novaeguineae* unknown) were being purchased ready for shipment to rearing farms in Singapore, a collection station was controlled by merchants in Jayapura and another located on Biak; these crocodiles and hides were traded through Jakarta or direct with Singapore (Webb, 1981). The scale of illegal skin exports is discussed in the next section. Dixon *et al.* (in press) showed that the average belly width of *C. novaeguineae* skins imported to Japan from Indonesia varied between 26.9 cm and 39.6 cm, while those from PNG were between 20.3 cm and 28.2 cm, being both smaller and less variable in size.

INTERNATIONAL TRADE The number of *C. novaeguineae* skins in trade in the 1960s increased as hunters turned to this species after shooting-out most *C. porosus* in accessible waterways, but this was followed by a marked decline after 1966 as *C. novaeguineae* populations in turn became depleted (Downes, 1971). The volume of *C. novaeguineae* skins produced in the PNG trade fell from 62 948 in 1974 to 17 690 in 1975 after the introduction of new control measures, but then gradually increased again to 35 374 in 1979 (Hollands, 1987). More recent export figures are given in Table 3. Minimum net imports of skins of *C. novaeguineae* recorded in CITES Annual Reports are shown in Tables 1 and 2. The principal importers have been Japan, the USA, Italy and France. The number of skins reported to have originated in PNG (Table 2) shows fairly poor correlation with those elsewhere reported to have been exported (Table 3), due partially to the fact that PNG did not submit annual reports to CITES in 1981 or 1982. The number of skins said to have originated in Indonesia in Table 2 similarly gives a very poor indication of the true volume of the trade, and this subject was examined in detail by Luxmoore (1986). Lever (1980a) considered that about 10 000 skins were exported annually from Irian Jaya, around 90% of these being *C. novaeguineae* (Lever, 1980b). Dixon *et al.* (in press) examined the records of skin dealers in Japan and estimated the total numbers of skins of *C. novaeguineae* imported into Japan directly from Indonesia and via Singapore to be 518, 669, 976, 513, 1680, 745, 832 and 2856 in the eight years from 1977 to 1984 respectively. Similar imports from PNG over the same peiod were estimated at 5108, 9785, 10 624, 10 728, 7920, 7956, 8363 and 9706. However they pointed out that independant evidence from Japanese Customs import records indicated that the figures supplied by the dealers only accounted for between 5 and 48% of the total amount of crocodile skins imported from Indonesia over this period. Correlation between the dealers' and Customs data was much better for

imports from Papua New Guinea (over 70%). If the imports from Indonesia are increased proportionately to take account of this discrepancy, they would vary from 10 861 in 1977 to 6012 in 1984. These figures are closer to Lever's (1980a) estimates of the trade.

Table 1. Apparent minimum net imports of skins and live animals (L) of *C. novaeguineae* reported to CITES. Some transactions were reported in terms of length or weight but the quantities involved were insignificant and these data have been excluded from the table. A few live imports, although noted in the table, are ignored in the figure for total volume for each year.

	1980	1981	1982	1983	1984	1985
Australia	2 L	2	2 2 L	21	–	–
Austria	383	–	66	210	107	107
Bahamas	–	–	–	2	–	–
Belgium	37	–	–	24	–	–
Canada	1368	–	1 L	–	–	–
Denmark	63	–	–	–	–	–
France	–	–	–	–	8863	12660
Greece	74	–	–	3	–	–
German D.R.	–	–	–	29 1 L	–	–
Germany, F.R.	1522	286	85	940 1 L	–	–
Hong Kong	279	262	34	2010	169	180
Iceland	–	–	–	110	–	–
Israel	11	–	–	–	–	–
Italy	5838	21865	5102	5426	–	–
Japan	5098	493	1680	15915	16428	24904
Korea	10	–	–	–	–	–
Kuwait	11	–	–	–	–	–
Liberia	367	–	–	12	–	–
Mexico	–	1	–	–	–	56
Morocco	–	–	–	–	–	6
New Zealand	84	–	–	–	–	–
Saudi Arabia	–	–	–	82	–	4
Singapore	–	–	874	–	–	–
South Africa	12	–	–	–	–	8
Spain	88	–	–	–	3	3
Sweden	–	–	–	10	–	–
Switzerland	4693	4306	4088	2117	2454	2393
Taiwan	–	–	–	–	4	–
UAE	–	–	–	12	–	–
UK	–	–	3		–	–
USA	13029	21282	2396	1125	1128	1160
Total	32967	48496	14330	28048	29156	41481

Table 2. Reported countries of origin (or exporting country if no origin reported) and quantities of transactions in skins of *C. novaeguineae* reported to CITES. Transactions reported in terms of length or weight have been excluded from the table.

	1980	1981	1982	1983	1984	1985
a. Countries having wild populations of *C. novaeguineae*						
Indonesia	3851	1455	3503	8957	7391	17319
PNG	11060	15097	5812	25304	22525	20678
b. Countries without wild populations of *C. novaeguinae*.						
Argentina	–	–	–	–	–	1232
Australia	200	–	–	–	–	–
Austria	–	–	–	12	–	–
Denmark	–	–	157	–	–	–
France	842	154	–	–	–	–
Guinea	–	–	–	24	165	–
India	–	–	–	–	–	396
Malaysia	100	–	–	–	–	115
Philippines	–	60	–	–	–	–
Singapore	10781	20882	3051	170	686	2201
South Africa	–	–	–	–	54	–
UK	36	–	–	–	–	–
Unknown	8487	11204	1886	1010	12	–

Table 3. Exports of *C. novaeguineae* skins from Papua New Guinea (Hollands, 1987)

1980	1981	1982	1983	1984	1985
27709	15021	24733	15111	21268	n/a

CONSERVATION MEASURES

Indonesia Nominally protected to some extent by legislation in Irian Jaya. The species is listed as protected in Irian Jaya (Law No. 327/Kpts/Um/5/1978), but it has been proposed that limited hunting should be allowed by permit under control of the Ministry of Agriculture (360/Kpts/Um/8/1975) (Lever, 1980b).

In Irian Jaya the species appears to occur in the Gunung Lorentz Nature Reserve, although severely depleted, and in Pulau Dolok and Wasur Game Reserves (Lever, 1980b), also in proposed Mamberamo-Foja, Jayawijaya, Bintoni Bay and Danau Bian Nature Reserves (Petocz, 1982).

Despite legal protection, illegal trade in crocodile skins from Irian Jaya is proceeding at an alarming rate; and illegal exports exceed by a large margin those officially authorised (Lever, 1980b; Whitaker *et al.*, 1985; Luxmoore, 1986; Cox, 1987; Anon., 1987; Dixon *et al.*, in press). The size of the skins in trade, 9-38 inch (c 23-96.5 cm) belly width (Lever, 1980b), are

generally larger than those exported from PNG (Dixon *et al.*, in press), indicating that breeding adults are being killed.

Commercial utilization has been identified as the only route to effective conservation (Petocz, 1982). The real difficulties of preventing over-exploitation are recognized, and a management project, funded by FAO, has been initiated which hopes to establish a controlled harvest and ranching programme similar to that operating in neighbouring PNG (Cox, 1987). At the 6th meeting of the Conference to the Parties to CITES in 1987, an agreement was reached with the Japanese CITES Management Authority that all imports of crocodile skins from Indonesia should be verified with the Indonesian Management Authority before they were allowed into Japan. Singapore, the other main importer, did not give such an undertaking.

Papua New Guinea Crocodile management is controlled by the Crocodile Trade Ordinance, 1966 and the Crocodile Trade (Protection) Act. Hunting may only be carried out by land-owners or with their permission, but beyond that hunting is unregulated. Control is achieved by licensing those who wish to trade in skins. The selling of skins having a belly width greater than 20" (51 cm) or of less than 7" (18 cm) is prohibited. Smaller animals may be caught and traded live for sale to ranches, but they may not be killed for skin trade. All exports must be licensed (Hollands, 1987). It appears that this programme has been relatively successful in managing the crocodile harvest. Populations of both *C. novaeguineae* and *C. porosus* have increased in thr Sepik River area. The numbers of skins in international trade are in relatively close aggreement with the numbers authorised for export, and the Japanese skin importers report that the great majority of skins from PNG fall within the legal size limits (Dixon *et al.*, in press), all of which indicate that there is little unregulated trade. It has been suggested that the maximum legal skin size in Papua New Guinea trade should be reduced from 51 cm to 41 cm (16 inches) to ensure protection of females in the first year of breeding (Montague, 1982b).

CAPTIVE BREEDING Most of the farms currently rearing *C. novaeguineae* in PNG and Indonesia depend for their stock on hatchlings captured in the wild and there is little if any captive breeding. There are in the region of 11 farms operating in PNG, but the great majority of the stock is held in only two large commercial farms. In 1983 the stock of *C. novaeguineae* was estimated to be 11 250 (Luxmoore, *et al.*, 1985). The percentage of skins exported by the farms was small until 1983 but increased to around 50% of the wild harvest in 1984 (Hollands, 1987). There are currently 21 ranches in Indonesia which have a capacity of 20-30 000 head. It is estimated that annual production from these could rise to 15-20 000 in the next three years, of which 75% would be *C. novaeguineae* (Anon., 1987). Some farms in Singapore are believed to be keeping *C. novaeguineae* (Luxmoore *et al.*, 1985).

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ESTUARINE or SALTWATER CROCODILE

Recommended list: 2
[Possible problem]

Crocodylus porosus Schneider 1801

Order CROCODYLIA

Family CROCODYLIDAE

SUMMARY AND CONCLUSIONS A widespread species, occurring from Sri Lanka, eastern India and Bangladesh, through coastal southeast Asia to the Philippines, Western Carolines, and south through Indonesia to Papua New Guinea and northern Australia, east to the Solomon Islands and Vanuatu. Individuals have been recorded at sea and on land far beyond the breeding range. The largest extant crocodilian, reported to have attained around 9m length. Typically asssociated with brackish waters, such as coastal mangrove swamp-forest, but also extends to freshwater rivers and grass-swamp. Males are sexually mature at around 3.2 m, 16 years, and females at 2.2 m, 10 years. Clutch size 25-90 eggs, usually around 50. Very severely depleted, rare and declining through most of the range, adequate population levels are maintained in parts of north Australia and New Guinea. Listed as Endangered in the IUCN Red Data Book. Listed in CITES Appendix I, except the populations in Australia, PNG and Indonesia which are listed on Appendix II. Depleted, and still threatened, by extensive hide-hunting and habitat destruction. Nominally protected by legislation through much of the range. Active research and management programmes are operating in Australia, India and Papua New Guinea. Breeds on a few commercial farms. The PNG rearing scheme is designed to improve rural economies by trade in skins from hatchlings reared in captivity from wild-collected young, and conserve wild populations by decreasing indiscriminate hunting. A monitoring programme has been developed to determine the effect of the scheme on wild populations.

The Australian *porosus* population was very severely depleted by hunting between 1945-1972. Expert opinion is divided over the status of this population; some workers believe a substantial recovery has taken place since protection of the species, with an estimated total population of 30 000-40 000 representing 30-50% of pre-war levels though there is uncertainty of what these were, others believe that recovery is slight and assert that the species has no future in the country outside protected areas. Published data indicate a small rise in numbers in many waterways and an increase in the proportion of large individuals. It seems likely, although this is disputed by some, that the Australian population can sustain the limited harvest neccessary for commercial ranching; ca 4350 *porosus* are currently held, with an projected 1986 export of 470 skins. Monitoring in the Sepik River area of Papua New Guinea has indicated a progressive increase in nesting numbers, with 1985 levels being 160% of 1982 levels; it is suspected that this is an adequate reflection of the national situation. Present management and trade in ranched crocodiles, with a mean annual export of 3163 hides in 1980-1984, seems to be compatible with survival and recovery of the resource, providing that adults are strictly protected.

The species appears to be severely depleted throughout its range in Indonesia, with the possible exception of parts of Irian Jaya, but even here a recent consultancy established that the species requires effective protection and rehabilitation before commercial ranching can be considered. There has been a small legal export from Indonesia in recent years but there is said to be a substantial illegal trade. Transfer of the Indonesian population from Appendix I to II was premature since there is no evidence that it can sustain the heavy illegal trade. A recent programme, set up with assistance from FAO, has attempted to bring the trade under control, but it is too early to say whether it has been effective.

Crocodylus porosus

N.B. Appendix I and Appendix II populations are treated separately in the Distribution and Population sections of this account.

DISTRIBUTION *Crocodylus porosus* has an extensive distribution in south and South East Asia, extending eastward into Melanesia. Basic distribution data are given below; see 'Population' section for further details. Breeding populations are highly localized within the overall range due to extreme depletion of the species in most areas and to habitat preferences (large rivers, estuaries, coastal and inland swamps).

Although a specimen was obtained from southern China in 1912, in the vicinity of Hong Kong (Smith, 1931), there are no recent records; it is uncertain whether there was a breeding population at that time. Formerly present in Singapore, but there have been no resident *porosus* for over 30 years (King *et al.*, 1979).

Wandering individuals have been seen at sea and recorded from localities far outside the known breeding range, such as the Fiji Islands and Cocos-Keeling Islands. One 3.8-m male was found at Ponape in the eastern Caroline Islands, some 1360 km from the nearest population (Allen, 1974), and a specimen has been sighted at sea 480 km north of New Zealand's North Cape (Robb, 1980).

Appendix I populations

Bangladesh Formerly occurred in most rivers south of 23°15'N, throughout the Sunderbans and much of the Chittagong area in the east. By the early 1950s all populations in Chittagong, the Meghna and Balleshwar estuaries and northern parts of the Sunderbans had disappeared (Khan, 1980) and the species is now restricted to southern parts of the Sunderbans. Preferred rivers (based on interviews with locals, not actual sightings) appear to be the Balleshwar, Bhola, Sela, Katka, Ambaria Ghat, other tributaries of the Pusur, Bhadra and part of the Sibsa between 22°N and 22°40'N (Khan, 1980).

Brunei Present in coastal wetlands; no details available.

Burma Mainly confined to the Irrawaddy Delta, but also present in Arakan, between Ramree Island and the mainland (Salter, 1983).

Federated States of Micronesia Occasional strays have been reported from Pohnpei and Truk Islands which are considered to originate from New Guinea (USA CITES MA, 1987).

India Restricted to two sites on the mainland; the Sunderbans of West Bengal (in the north-east) and the Bhitarkanika Wildlife Sanctuary in the Brahmani-Baiterani delta of Cuttack District, Orissa (northern sector of the east coast). Formerly more widespread and present in suitable mangrove habitat at many parts of the east coast, extending to Kerala on the west coast. Also present in the Andaman and Nicobar Islands. (Bustard and Choudhury, 1980; Whitaker and Daniel, 1978)

Kampuchea Probably present formerly; no recent information.

Malaysia Recorded from Peninsular Malaysia but now virtually extinct although formerly widespread and common (King *et al.*, 1979). Present in Sabah (Whitaker, 1984) and Sarawak (Proud, 1981 cited in Groombridge, 1982).

Palau Islands [Belau] (U.S. Trust Territory of the Pacific Islands) Restricted to the Palau group in the western Caroline Islands (Allen, 1974).

Philippines Present in the Cagayan River (draining north-east Luzon), Mindoro Oriental, Catanduanes, Palawan, and in seven provinces of Mindanao; probably more widespread formerly (Ross, 1984).

Solomon Islands Present on most larger islands and many smaller islands in the group (McCoy, 1980).

Sri Lanka The main breeding population is in the south-west wet zone, centred on the rivers draining into the formerly more extensive swampland stretching from Puttalam south to the tip of the island (Whitaker and Whitaker, 1979).

Thailand Probably extinct, the last confirmed record was from Ko Tarutao in Changwat Satun in 1971 (Bain and Humphrey, 1980).

Vanuatu The main population was centred on the Sulphur River-Alligator River area, north of Port Patteson, on Vanua Lava in the Banks Islands group (Luders, 1983); this population now appears to be virtually extinct. Single individuals have been reported form Espiritu Santo and Malo.

Viet Nam Reported to persist in the lower Mekong and Rung Sat Swamp (Nowak, 1976).

Appendix II populations

Australia Present in coastal regions of the far north in western Australia, Northern Territory and Queensland (Cogger, 1979).

Indonesia Populations are widespread although generally small and scattered. Recorded from the following areas, in approximate west to east order: Sumatra, Siberut, Java, Kalimantan, Lesser Sundas, Sulawesi, Moluccas, Irian Jaya, Timor.

Papua New Guinea The species has been reported from all of Papua New Guinea's nine lowland provinces, also the island provinces of Manus, New Ireland, West and East New Britain, North Solomons, and Milne Bay (includes portion of mainland) (Whitaker, 1980). Formerly widely distributed and common in the mangrove areas at the mouths of the Sepik and Fly, and around the Gulf of Papua, now largely absent from easily accessible areas and found more frequently in inland swamp habitat (Whitaker, 1980). Main centres are the swamps along the Sepik and Ramu rivers in the north, and swamps of the Fly River and other rivers draining into the Gulf of Papua in the south (Bolton, 1978). On the Sepik River, the species occurs inland to the Irian Jaya border, although numbers decrease in relation to *C. novaeguineae*, and on the Fly *porosus* has been recorded 500 km from the sea (Whitaker, 1980).

POPULATION Severely depleted and at risk almost throughout its range (King *et al.*, 1979). Adequate population levels are maintained in only a few localities, notably parts of northern Australia and parts of New Guinea (Irian Jaya and Papua New Guinea).

Appendix I populations

Bangladesh The current population, restricted to southern parts of the Sunderbans (but formerly extending from 23° 15' N throughout the Sunderbans and much of the Chittagong area), is estimated at fewer than 200 individuals in an area of c 780 sq. km out of the Sunderban area of 6000 sq. km (Khan,

1980). This population is of considerable importance, it stands a good chance of surviving since it is within a protected reserve for Tiger *Panthera tigris* and the Sunderbans area remains relatively hazardous and difficult of access for humans (Whitaker, 1981 cited in Groombridge, 1982).

Brunei No detailed information available, scattered specimens are sometimes seen in the coastal mangrove and Nipa palm swamps. A 1978 report indicated a trade in young crocodiles, bought mostly by operators of commercial rearing stations (King *et al.*, 1979).

Burma Only small isolated populations remain (Whitaker and Daniel, 1978). The main concentration, comprising c. 4000 individuals of all size classes spread over the entire Irrawaddy Delta, but mainly in the east, is depleted and decreasing (Caughley, 1981 cited in Groombridge, 1982). The Delta population was reportedly (King *et al.*, 1979) subject to heavy exploitation in the late 1970s following control of Karen insurgents in the area. The Arakan coast population also appears to have greatly declined since the early 1960s, due to conversion of mangrove habitat to agriculture and to hunting (Salter, 1983).

India Formerly extended from the Cochin area of Kerala on the west coast, southward around the tip of the peninsula, and northward along the east coast to the Sunderbans in West Bengal. Also present in the Union Territory of the Andaman and Nicobar Islands. Previously abundant wherever suitable habitat, preferably estuarine mangrove forest, occurred; now severely depleted and rare or extinct in most of its former range in India (Bustard and Choudhury, 1980). Extinct in Kerala, Tamil Nadu and Andhra Pradesh (a 3.2-m specimen captured January 1979 in the Krishna estuary in A.P. is thought to have been a wandering individual) (Bustard and Choudhury, 1980). The species persists at two localities on mainland India; in West Bengal, where a small number occur in the Sunderbans (Bustard and Choudhury, 1980; Kar, 1981 cited in Groombridge, 1982), and in Orissa, where the major mainland Indian population occurs in Bhitarkanika Wildlife Sanctuary (Bustard and Choudhury, 1980; Daniel, 1980). The Sanctuary was founded on Kanika Island in the Brahmani-Baiterani delta area. The entire Bhitarkanika population comprises only 35 adult *C. porosus*, and at the end of 1976 there were in addition 61 crocodiles of 1-1.4 m length, the hatchlings of the 1974 season. The young of 1973 had virtually all disappeared by late 1975, and increased survival of the 1974 cohort is attributed to the protection afforded by declaration of the area as a Sanctuary in 1975 (Bustard and Choudhury, 1980). The Bhitarkanika area is probably unique in that ten per cent of the adults in this protected population exceed 6 m in length (Bustard and Choudhury, 1980), and the largest male exceeds 7 m (23'-24') (Kar, 1981 cited in Groombridge, 1982). Such a high proportion of extremely large animals is unknown elsewhere. The species was said to be abundant in the first half of the present century in several islands of the Andaman and Nicobar groups (Choudhury and Bustard, 1979; Whitaker and Whitaker, 1978), but the populations here are now depleted (Bustard and Choudhury, 1980; Choudhury and Bustard, 1979; Whitaker and Whitaker, 1978). On North Andaman Island, probably the best remaining area for *C. porosus* in the Andaman group, a June-July 1978 survey suggested presence of 36 nesting females (Choudhury and Bustard, 1979). Other workers (Whitaker and Whitaker, 1978) provide the following approximate figures for breeding females, based on field surveys and interviews; North Andaman - 50, Middle Andaman - 20, South Andaman - 10. The total *porosus* population may be 170-330. Populations are reported to be healthy in the Nicobars (Whitaker and Whitaker, 1978), although no precise information is yet available. Human predation on eggs, killing of adults, and loss of habitat exert a continuing pressure on the Andaman-Nicobar populations (Choudhury and Bustard, 1979; Whitaker and Whitaker, 1978).

Malaysia West Malaysia, uncommon and declining, considered essentially extinct (Bullock in King, 1973; King *et al.*, 1979; Scriven, 1972; Wycherley, 1971), a few *porosus* may remain in Tasek Bera Lake and the Pahang River (King *et al.*, 1979). Sarawak Cox and Gombek (1985) surveyed several river systems and concluded that populations of *C. porosus* were as low as 0.054 per km. Comparing this with similar habitats in PNG and northern Australia, they concluded that the species could be considered endangered, being seriously depleted to less than 1% of the estimated population levels before the advent of hunting. Sabah, becoming rare, reported extinct in much of the former range (source in King *et al.*, 1979). During 32 days of fieldwork in April-June 1983, 56 *porosus* were seen along the 1146 km of river surveyed. This suggests a very low density of 0.46 per km, in contrast to 4-12 per km in healthy populations. By extrapolation Sabah's total population may be around 2600 (Whitaker, 1984).

Palau Islands [Belau] Reported to be still relatively common in the Palau group in the late 1970s (sources cited in Webb, 1978). A total of 300 crocodiles were killed in a 1975 control programme, present status unknown. A recent report stated that some illegal hunting occurs; skins from such activities are exported to Japan. Overall, the population was thought to have not recovered since the control programme eradicated the larger animals and the population size was considered to be declining owing to habitat loss (USA CITES MA, 1987).

Philippines Considered threatened, although isolated and depleted populations persist. Present in the Cagayan River (draining north-east Luzon), Mindoro Oriental, Catanduanes, Palawan, and in seven provinces of Mindanao; probably more widespread formerly (Ross, 1984). Local populations were reported healthy in 1978 in Lake Danau, Camotes Island, along the north shore of Moro Gulf in Minadanao, perhaps in the Sulu Archipelago and Leyte (King *et al.*, 1979). However, more recent information (1981) indicates a marked decline; no crocodiles are now known to survive on Camotes Island or in Lake Danau (Ross, 1982).

Solomon Islands Declined in numbers since World War II, largely due to hide-hunting. Only an occasional individual is now encountered on the larger islands. A relatively large population, perhaps up to 300 individuals, occurs on one small island where nesting occurs regularly. The persistance of this population is attributed to the fact that crocodiles are sacred totemic animals to the local people (McCoy, 1981 cited in Groombridge, 1981).

Sri Lanka The species appears to have been abundant around much of the coast until the early part of the 20th century, but is now severely depleted (Whitaker and Whitaker, 1978), and rapidly dwindling outside the two main National Parks (Whitaker, 1986). A recent estimate suggests around 250 individuals (excluding first year hatchlings), with 25 breeding females, along the southwest coast, and 125 individuals, with 15 breeding females, in the rest of the island (Whitaker and Whitaker, 1978). The main breeding population is in the heavily populated south-west wet zone and is concentrated in remnants of formerly more extensive swampland, extending from Puttalam on the west coast, southward to the southern tip of the island (Whitaker and Whitaker, 1978). The best areas are centred around the main rivers draining into this coast, the Maha Oya, Kelani Ganga, Bentota Ganga, Gin Ganga and Nilwali Ganga (Whitaker and Whitaker, 1978). Breeding unconfirmed elsewhere (King *et al.*, 1979). Still present at some east coast sites where formerly more common e.g. Batticaloa lagoon (Whitaker and Whitaker, 1978). Also reported in the Mahaweli Ganga up to Mahiyangana (about 125 km inland) in the east, and within the Yala National Reserve (Hoffman, 1981 cited in Groombridge, 1982). Population in Sri Lanka continues to decline, chiefly due to habitat loss. The Mutharajavela swampland between Negombo and Colombo, a

former main breeding site, is being cleared as it lies within a 'Free-Trade Zone' (Farook, 1980; King *et al.*, 1979; Whitaker and Whitaker, 1978). A suitable reserve area will be necessary to ensure survival of *C. porosus* (Farook, 1980; Whitaker and Whitaker, 1978).

Thailand Probably extinct (Bain and Humphrey, 1980), no more than ten adults may remain (King *et al.*, 1979), the last confirmed specimen came from the area of Ko Tarutao in Changwat Satun in 1971 with no confirmed sighting since (Bain and Humphrey, 1980).

Vanuatu Single individuals have been reported during 1980-1981 from south Espiritu Santo and west Malo, but the main population appears to have been located in the Sulphur River-Alligator River area on Vanua Lava in the Banks Islands group (Dickinson, 1981). Local tradition is that this population is descended from a single colonizing female. Breeding appears to have occurred in the recent past since individuals of all sizes could be seen; the total population may have numbered around 200 (Luders, 1983). Hunting does occur sporadically; in 1973 a group of Solomon Islanders shot seven crocodiles for hides and a 4.8 m individual (maximum recorded length for Vanuatu) was shot by an Australian in 1980 (Dickinson, 1980, 1981 cited in Groombridge, 1982). This population appears to have become virtually extinct by 1983; this is attributed largely to the effects of the 1972 cyclone which, with associated flooding, caused massive destruction in the area (Luders, 1983).

Viet Nam Status and distribution little-known. Reported to persist in the lower Mekong River and Rung Sat Swamp (Nowak, 1976). Not recorded north of Ho Chi-Minh (Saigon) (Smith, 1931).

Appendix II populations

Australia Populations declined greatly during the 25 years following World War II due to extensive hunting for skins (Jenkins, 1979; Messel, 1977). The species may be responding to protection, although slowly (Messel and Vorlicek, 1986), and may not be at risk while this is maintained (Webb *et al.*, 1984).

The published body of data concerning the habitat, biology, numbers, and size distribution of *C. porosus* in various water bodies in northern Australia is vastly greater than for any other crocodilian, with the possible exception of the American Alligator. However, the interpretation of these data, in terms of population status and trends, remains controversial.

In an overview of the major ten-year research programme undertaken by the University of Sydney, the scientists involved state that the *C. porosus* population "appears to be recovering at a very slow rate...it may take many decades to recover - if ever". Further, "we can realistically and unfortunately conclude only this about the saltwater crocodile's future: it has none" (Messel, *et al.*, Monograph 18 [Part 4, Abstract] in 1979-1984 series; Messel and Vorlicek, 1986).

On the other hand, in the Australian proposal to transfer its *porosus* population from Appendix I to Appendix II of CITES (documentation prepared by the Conservation Commission of the Northern Territory), it is stated that available data (including those from the University of Sydney) "provide unequivocal evidence of a population which has been increasing since protection: not one which is decreasing or threatened" (Webb *et al.*, 1984).

This dichotomy of views, or at least of emphasis, persists in the estimate for the total *C. porosus* numbers in Australia. Messel *et al.* (1984) and Messel and Vorlicek (1986) state that their 1979 maximum figure of 15 500 crocodiles over 3' in length was likely to apply also to the 1983 population.

This estimate comprises 10 000 in Northern Territory; 2,500 in the Kimberley region of Western Australia; 3000 in northern Queensland. These figures are extrapolations from estimates based on actual surveys of a major proportion of the total length of tidal waterways in the Northern Territory but only a small proportion of the tidal waterways in Western Australia and Queensland. Freshwater swamps and other freshwater habitats remain inadequately surveyed. According to the Sydney team (Messel, 1981 cited in Groombridge, 1982; Messel *et al.*, 1979-1984), populations in the Northern Territory are slowly recovering in tidal waterways of northern Arnhem Land and the Alligator Rivers Region; populations from the Adelaide River westward to the Western Australian border are steady or still falling; populations in the Gulf of Carpentaria are at extinction levels with the exception of the Roper and Towns Rivers. In Western Australia, populations probably recovering very slowly in major sections of the Kimberley tidal waterways. Burbidge and Messel (1979) estimated that the total non-hatchling population in Western Australia was about 2000. Taplin (1987) reviewed the size of crocodile populations in Queensland, and concluded that some recovery of crocodile populations had occurred since protection was implemented, but that it was very difficult to quantify. The major populations of *C. porosus* occur in the Weipa area of north-western Cape York Peninsula. Messel *et al.* (in prep.) resurveyed this area in 1987 and concluded that there was good evidence of a slow population recovery since 1979. However they cautioned that human population pressures on crocodiles were very much greater on the east side of the peninsula.

Messel *et al* (1979-1984) and Messel and Vorlicek (1985, 1986) provide abundant evidence of the highly dynamic nature of *porosus* populations in northern Australia; although a population model involving density-dependent mortality is consistent with this evidence, these authors play down the possible role of this factor in the present situation and stress instead their belief that major recovery in numbers and age-structure of *porosus* populations is a very long term process.

Webb *et al.* (1984) estimate that at least 30 000 individuals, and probably closer to 40 000, remain in Northern Territory alone. This figure is in part an extrapolation based on the extent of suitable habitat, and appears to include hatchlings, or at least crocodiles up to 3' in length. These authors use data from the Blyth-Cadell Rivers system to exemplify the general Northern Territory trend. In this system there has been a 35% population increase since protection in 1972, and an increase in the proportion of large animals. Continuing recruitment, decreasing numbers of 3-5' crocodiles, and an increasing number of crocodiles of 6' and over, are consistent with the effects of density-dependent mortality. It may well be that this system is approaching its carrying capacity. Populations along much of the Northern Territory coast region are said to show similar trends, though usually with a greater proportional increase in total population size (Webb *et al.*, 1984).

One likely cause of these differing interpretations is the uncertainty over the magnitude of decline suffered by *porosus* populations during the 27 years of concentrated hunting between 1945 and 1972 (when federal prohibition on import-export was implemented). While the present population has been estimated as a small fraction of the pre-hunting population, other authors argue that populations in the Northern Territory are 30-50% of pre-war levels (Webb *et al.*, 1984). This divergence of views, apparently caused in part by differing concepts of primordial population levels, is superimposed on that caused by differing approaches to the interpretation of raw survey data in terms of population levels and structures.

However difficult it may be to fully reconcile the opposing views that have been expressed on the Australian *porosus* population, the evidence appears to indicate that some degree of population recovery has taken place in the the

later 1970s and early 1980s, with a small observed increase in the number of non-hatchling crocodiles in some waterways, and, perhaps more importantly, a more general increase in the proportion of large animals (over 6' in length). Furthermore, the Sydney team, while generally taking a more pessimistic view of the recovery prospects of *C. porosus* than other workers, now appears to agree (Messel and Vorlicek, 1986: 110) that crocodile farming should be encouraged, with eggs being removed from nests known to be flooded during January-March. Webb *et al.* (1987) provide a discussion of crocodile populations in Australia in relation to proposed exploitation and management.

Indonesia Regional information available is as follows, in approximate west to east order. Sumatra, becoming rare everywhere but still present in most large rivers of the east coast (MacKinnon, 1981). Present in the Kluet area of Leuser National Park in northern Sumatra, in general survival prospects are poor due to disturbance and diminishing habitat (Wind, 1981 cited in Groombridge, 1982). Siberut, formerly common but now depleted, due to hunting in the south at least. Presence of *porosus* is confirmed in part of the Bay of Tiop in the south, presence reported but as yet unconfirmed in estuaries and swamps in the uninhabited north-west (within Reserve area), including rivers Simarausau, Bolot, Tobakle, Torokatkat, Taio, Togilitte, Sinlingkle, Tamaerak, also lakes at Gobjib and Bolot (Mitchell, cited by MacKinnon, 1981). Java, almost extinct, a few left in Ujung Kulon (MacKinnon, 1981), no confirmed reports in the last three years (up to 1981) from East Java and very few unconfirmed reports (Blouch, cited by MacKinnon, 1981). Kalimantan, becoming very rare (MacKinnon, 1981), a 1972 survey of 200 miles of the Mahakan River revealed only two adult *porosus* (King *et al.*, 1979). Lesser Sunda islands, rare (MacKinnon, 1981). Sulawesi, a few small surviving populations, e.g. Randangan estuary on North Peninsula (MacKinnon, 1981). Formerly common at the mouths of the Sausu and Tambarana Rivers (Teluk Tomini) but no longer, following the increase in human population due to two large transmigration schemes; overall, rare in Sulawesi with poor survival prospects (Watling, cited by MacKinnon, 1981). Maluku (Moluccas), reported common in Aru (MacKinnon, 1981) also reported severely depleted here (King *et al.*, 1979), still occurs in Wae Apu estuary on Buru, reported from Wahai near Pasahari on the north coast of Ceram, otherwise rare (MacKinnon, 1981). Timor, status unknown, breeding reported a decade ago on south coast (source cited in King *et al.*, 1979). Irian Jaya, scarce throughout its range in the province, although apparently more secure here than in other parts of Indonesia. Pulau Dolok, half of which is a Reserve, is a major stronghold (Lever, 1980). There is no evidence of any recovery after the 1980 ban on hunting and trade, and illegal skin exports continue (Whitaker *et al.*, 1985). Of the current populations in Indonesia, that in Irian Jaya appears to have the greatest potential for recovery. Whitaker *et al.* (1985) recommended that conservation of this species should be given high priority in any management programme; indicating that adequate restoration of the population was necessary before it could be included in any ranching scheme. A subsequent study (Anon., 1986) concluded that the combined population of *C. porosus* and *C. novaeguineae* was around 2 596 800, but this result was questioned by Cox (1987), who estimated that there were around 63 000 *C. porosus* in Irian Jaya.

Papua New Guinea The species remains widespread, but is depleted throughout its accessible range due to heavy exploitation for hides in the 1950s and early 1960s (Bolton, 1978; King *et al.*, 1979). Although exploitation is less in remote areas, it is never negligible, and there is at present almost no locality that is not subject to some kind of hunting (Pernetta, 1982 cited in Groombridge, 1982). While formerly common in the mangrove areas at the mouths of the Sepik and Fly, and around the Gulf of Papua, it is now scarce and occurs more frequently in inland swamp habitat (Whitaker, 1980). Main centres are the swamps along the Sepik and Ramu rivers in the north, and

swamps of the Fly River and other rivers draining into the Gulf of Papua in the south (Bolton, 1978). On the Sepik River, the species occurs inland to the Irian Jaya border, although numbers decrease in relation to *C. novaeguineae*, and on the Fly *porosus* has been recorded 500 km from the sea (Whitaker, 1980). In the islands, *C. porosus* is extremely depleted on Manus, New Ireland, somewhat depleted in North Solomons, sparse in East New Britain but more widespread and in greater numbers in West New Britain (Whitaker, 1979).

An active rearing programme, aided until 1982 by FAO/UNDP, is in operation in Papua New Guinea. Wild-caught young are reared for their hides. A major aim is to expand rural economies while conserving wild crocodile populations. Early results from the monitoring scheme in PNG, a component of the crocodile management programme, indicate that both crocodile species in PNG are now increasing in numbers. While there has been a small decrease in the number of *porosus* nesting in lake fringe habitats, probably as a result of greater vulnerability to hunting and disturbance, there has been a substantial increase in numbers nesting in overgrown oxbows and channels, and other river-margin habitats. The overall trend has been upward, with the March 1985 nesting index being 160% of the baseline 1982 figure (Hollands, 1984, 1987). The Sepik area is suspected to be adequately representative of the national situation. One urgent requirement is to continue and extend the protection of breeding adults by decreasing the upper size limit of skins permitted in trade (20" belly width) and further curtailing the taking of adults from the wild.

HABITAT AND ECOLOGY The largest extant crocodilian, *C. porosus* is dubiously reported to have attained around 9 m (30 feet) in length (Taylor, 1979) (based on a probably erroneous extrapolation from length of a preserved skull (Lang, 1981 cited in Groombridge, 1982)). The greatest authenticated length in recent years is 6.2 m (20'4") recorded on a male drowned in a barramundi net in the Fly River near Obo, Papua New Guinea (Whitaker, 1980); however, a very large skull preserved by the Raja of Kanika, Orissa, belonged to an individual estimated to have been around 7 m (23') in length (Daniel, 1980; Daniel and Hussain, 1974), and it is reported that the largest male in the Bhitarkanika area at present exceeds 7 m in length (Kar, 1981 cited in Groombridge, 1982).

The species typically occurs in brackish waters, inhabiting large river estuaries and deltas with associated coastal mangrove swamp-forest, but also extends into deep rivers far above tidal influence, also freshwater pools and swamps (Bustard and Choudhury, 1981; Smith, 1931; Webb, 1977). Through much of its range *C. porosus* is now mainly restricted to the mangrove system, in India for example, the remaining *porosus* populations occur only in this habitat (Bustard and Choudhury, 1981; Daniel, 1980). The same applies to populations in southeast Asia and Indonesia. In the Andamans *C. porosus* occurs in coastal streams, with mangroves, notably *Rhizophora mucronata* and *R. apiculata*, and *Brugiera*, giving way inland to cane brakes with *Calamus* and creeping cane, and semi-evergreen or evergreen riverine forest, with bamboo and scattered trees of *Dipterocarpus, Planchoria* and *Pinsonia* (Choudhury and Bustard, 1979).

However, while in Papua New Guinea the species has been typically associated with coastal mangrove, nipa and sago swamp, in some areas it is now more common in inland grass-swamp, and in the island provinces is most often found in inland lakes (even upland crater lakes and hill streams) (Whitaker, 1980). In Australia many *C. porosus* occur in tidal reaches with mangrove vegetation, and also occur in adjacent floodplain billabongs and spring-fed swamps which tend to be dominated by Paperbark *Melaleuca* and Pandanus palm, with a variety of sedges, grasses and vines. They may also extend 150 km upstream into freshwater non-tidal areas, and are well established in coastal

freshwater swamps with floating mats of vegetation (including *Phragmites, Typha* and *Cyclasaurus* fern) (Webb, 1977; Webb, 1981 cited in Groombridge, 1982). As in Papua New Guinea, the present distribution of *porosus* and nesting activity through these habitats partly reflects differential hunting pressure before protective legislation (Magnusson *et al.*, 1978), as well as location of optimum nest sites. Hunting is easiest when crocodiles are exposed on mudflats of coastal mangrove.

C. porosus appears to be a largely opportunistic feeder, and the nature and size of the prey taken varies with age and habitat (Taylor, 1979; Webb, 1977). Feeding occurs during the day and night, when food is available, and on both ebb and flood tides in tidal regions. They are mainly shallow water or water-edge feeders. Crustaceans and insects comprise most of the diet of hatchlings and juveniles, mainly grapsid crabs of the subfamily Sesarminae and Palaemonid shrimps of the genus *Macrobrachium* (Taylor, 1979). Crustacea and insects are also the main diet of subadults in the India-Burma region (Smith, 1931), the stomach of a 2.5 m individual from the Irrawaddy was packed with crabs (Smith, 1931). Juveniles feed mainly along the water's edge and among mangroves at high tides. Larger juveniles, over 1.2 m length, take an increasing proportion of vertebrate prey (Taylor, 1979; Webb, 1977). Food items recorded include sharks, archer fish, barramundi, pop-eye mullet, mullet, mudskippers, white-bellied mangrove snakes, cormorants and magpie geese (Messel, 1981 cited in Groombridge, 1982; Messel *et al.*, 1979-1984). As size increases an individual becomes able to deal with progressively larger prey, including sharks, turtles, cattle, horses and humans. Large crocodiles may be cannibalistic and will take *porosus* hatchlings and small juveniles (Messel, 1981 cited in Groombridge, 1982; Messel *et al.*, 1979-1984).

Sexual maturity appears to be attained at around 3.2 m, 16 years, in males and 2.2 m, 10 years in females (Webb *et al.*, 1978). The grouping behaviour shown by hatchlings is lost at about 8 months and territorial behaviour begins at about 2.5 years, several years before first breeding. The time of nesting varies between localities through the extensive range of the species, but often coincides to some extent with the annual wet season (Lang, 1980; Webb, 1977; Webb *et al.*, 1977). Nesting may be spread over a 3-5 month period and females at a given locality nest asynchronously (Lang, 1980). In Papua New Guinea (Whitaker, 1979), nesting occurs in September-January (or into March), and begins with or before the rains. This timing may indicate hatchling requirements for shelter, food, and fresh water (in tidal areas), all of which are enhanced by the first rains (Lang, 1980; Whitaker, 1979). Nesting is in April-September in northeast India and the Andamans (here coincident with the onset of the southwest monsoon (Choudhury and Bustard, 1979). In Australia nesting occurs mainly in the wet season; the first nests are made in October/November and the majority of nests are made in January/February. However, sporadic nesting occurs at least until August, and may occur throughout the year in suitable habitat (Jenkins, 1981 cited in Groombridge, 1982). Minor peaks in nesting may correspond with falling flood levels in tidal areas, but in freshwater swamps such late nests are often next to (and in one case on top of) an earlier nest strongly suggesting multiple nesting from the one female (Webb, 1981 cited in Groombridge, 1982). On the west coast of Sri Lanka nesting takes place in July-August (Deraniyagala, 1939), the height of the monsoon season (Whitaker, 1981 cited in Groombridge, 1982).

A mound nesting species, the nest may be constructed from a variety of vegetable debris. Along the tidal rivers of northern Australia nests are sited in adjacent freshwater swamps in downstream areas, and at the riverside or the edge of flood plain billabongs further upstream (Webb, 1977). In some coastal swamps almost all nests are constructed on floating mats of vegetation (Webb, 1981 cited in Groombridge, 1982).

The clutch comprises 25-90 eggs, but samples of nests in north Australia (Webb *et al.*, 1977) and in the Andamans (Choudhury and Bustard, 1979) showed remarkably similar mean clutch sizes of 50 and 51 respectively, range 40-62 (18 nests) and 42-67 (6 nests). Incubation period is 80-90 days (56,65) although this can be greatly extended in low temperatures (Webb, 1981 cited in Groombridge, 1982).

The female apparently remains near the nest for much of the incubation period, and on bank nests is often in one of the one to four wallows typically found immediately adjacent to the nest. Males appear to take no part in the nesting processs (Webb *et al.*, 1977). The female in captivity, and apparently in some areas in the wild (Shelford, 1916; Bustard and Kar, 1980), becomes aggressive during this phase and actively deters intruders, including other female *C. porosus* (Lang, 1980). This behaviour means that nest-guarding females are highly vulnerable to human hunters, and it has been suggested that the trait is now less frequently shown in wild populations (Bustard and Choudhury, 1980). Males in captivity also defend territories throughout the year (Lang, 1980). The female does not attend the nest continually for the entire incubation period, but frequently leaves it for short intervals (Bustard and Choudhury, 1980). She assists the hatchlings by opening the nest, probing with the snout and digging with fore and hind limbs, in response to their calling within (Lang, 1980; Webb *et al.*, 1977). Females are also reliably recorded (Bustard and Choudhury, 1980) to gather hatchlings in the throat pouch in times of danger, and probably to carry them in this way from the nest to water. At least some adult *C. porosus* remain in the water with grouped hatchlings for around two months (Webb *et al.*, 1977), in Arnhem Land rivers (Australia) for example, but creche formation appears not to be universal in Australia and may vary with river type and parental age (Messel *et al.*, 1979-1984, Monograph 1).

A high proportion of nests are lost due to various factors. In north Australia egg predation, mainly by Monitor Lizards *Varanus* spp. and humans, is minimal but losses due to flooding are extremely high. It is estimated that in the four year period up to 1977 over 90% of nests in areas studied were destroyed by flooding (Webb, 1977; Webb et al., 1977). By contrast in the Andamans of 30 nests found, 28 were destroyed by predators (human predation - 22 nests, Monitor lizard - 2, wild pigs - 2) and only 1 was flooded (Choudhury and Bustard, 1979). There is a possibility that some females nest more than once in a year (Messel, 1981 cited in Groombridge, 1982). In a captive breeding colony in Papua New Guinea (Lang, 1980) only one clutch was laid per season.

Adult crocodiles appear to tolerate hatchlings, and small crocodiles up to 3-4' in length in their vicinity, but not larger crocodiles in the same size class as themselves or the next smaller size class. It is stated (Messel *et al.*, 1979-1984) that this single factor is of critical significance, and alone largely determines the dynamics of *C. porosus* populations. Once a crocodile reaches the 3-4' (.93-1.24m) and 4-5' (1.24-1.55m) size classes, it is likely to be challenged increasingly by crocodiles near its own size and in the larger size classes and be excluded from the area it was able to occupy when it was smaller. A substantial fraction (80%) of the 3-6' (.95-1.86m) sized crocodiles may thus be excluded from the river or be predated upon by larger crocodiles. The overall numbers missing, presumed dead, remain high and appear to be some 60-70%.

THREATS TO SURVIVAL The drastic depletion of *C. porosus* throughout its range is attributed to commercial hide hunting (see below), a second factor is widespread loss of habitat; general animosity to the species and local use for food are factors of minor or local importance.

Crocodylus porosus

Habitat loss appears to reduce the recovery prospects of populations already depleted by hunting, and has been more severe in India than in most other areas of the range (Bustard and Choudhury, 1981). The coastal mangrove habitat, with which *C. porosus* is particularly associated, is a highly vulnerable system: such areas have very high soil fertility when reclaimed, and are often, as in India, accorded low management priority as their intrinsic economic and ecological value is not appreciated (Bustard and Choudhury, 1981). Similarly, coastal swamps, including mangrove, in Sri Lanka have been widely cleared and drained for use as agricultural or building land; this habitat loss is continuing (Farook, 1980; Whitaker and Whitaker, 1978). Habitat loss is the primary current threat in the Philippines, caused by expanding agriculture and aquaculture schemes (Ross, 1981).

In Australia the overall (Messel, 1981 cited in Groombridge, 1982; Messel *et al.*, 1979-1984) recovery of *C. porosus* could be halted or reversed by two main factors. Firstly, *C. porosus* nesting habitat on Northern Territory waterways is very vulnerable to destruction by trampling by feral water buffaloes *Bubalis bubalus*. The destruction of riverine and swamp habitat by these animals can be extreme and on rivers such as the South Alligator was reportedly almost complete by the late 1970s. The anchorage of floating mats of vegetation is broken down so that the whole mat drifts away in the wet season (Webb, 1981 cited in Groombridge, 1982). On Adelaide and Daly Rivers, Murgenella Creek, the East Alligator, West Alligator and Wildman Rivers the habitat has also been extensively destroyed; however, the last three of these (and the South Alligator River) are now within Kakadu National Park, which is subject to an intensive campaign to control Water Buffaloes. Elsewhere, the continued presence of these animals poses a severe threat to the long-term recovery of *C. porosus* populations. The second important factor is the toleration of net fishing for barramundi well upstream of tidal river mouths and often right up into the breeding areas (Messel *et al.*, 1979-1984; Jenkins, 1980). This is done legally and often illegally; it has been suggested that this is leading to marked depletion of stocks of barramundi and of *C. porosus* (Messel *et al.*, 1979-1984). In one river 23 large *C. porosus* were found drowned in barramundi fishermen's nets within a two week period and a considerable number of large specimens are probably drowned annually (Messel *et al.*, 1981). It is alleged (Messel *et al.*, 1981) that no effective action is being taken to counter this. It is often observed that rivers with large *C. porosus* populations also produce good commercial catches of barramundi, and it may be that the crocodile is beneficial to barramundi populations, perhaps by eating large numbers of predatory fishes (such as catfish) that would otherwise consume small barramundi (Jenkins, 1980).

Another factor is that general animosity toward crocodiles is often directed against *C. porosus* due to its large size, often aggressive behaviour if encountered near a nest, and tendancy to eat humans on occasion. This factor is likely to assume increasing importance where recovery of *C. porosus* populations is occuring (Webb, 1981 cited in Groombridge, 1982; Jenkins, 1980). Proud (1981 cited in Groombridge, 1982) reported that the few large individuals in the Rejang river, Sarawak, had been trapped due to man-eating habits, the local authority at Sibu offering a bounty for each specimen killed.

The species is sometimes used for food, for example eggs are heavily-collected in the Andamans (Choudhury and Bustard, 1979), or its parts used medicinally (Bustard and Choudhury, 1981). Eggs and meat are consumed in Papua New Guinea (Lever, 1982 cited in Groombridge, 1982).

C. porosus has been very extensively hunted for the leather trade; this has undoubtedly been the major factor in its decline (King *et al.*, 1979).

The hide of *porosus* yields the finest quality leather due to the small scute size and lack of bony osteoderms in the belly skin, resulting in a relatively large area of attractive, flexible, and commercially useable hide from any given skin (King and Brazaitis, 1971; Whitaker, 1979; Lever, 1982 cited in Groombridge, 1982).

Hide-hunting, carried out both by local people and by expatriates armed with high-velocity rifles and often with motor boats, was on a particularly large scale in the 1950s and 1960s. In this period there was a rapid worldwide increase in the price of reptile leather and it is estimated that hundreds of thousands of *C. porosus* were killed annually (Neill, 1971). In Papua New Guinea the estuarine and delta zones were mainly exhausted by the early 1950s (Whitaker, 1979). In Irian Jaya, and elsewhere, *C. porosus* occurred mainly in these readily-accessible areas and was thus the first crocodilian species to be over-exploited (Lever, 1980). Selective hunting for large crocodiles has resulted in a severe reduction in the breeding population and continued hunting has resulted in minimal recruitment into the population, although, in PNG at least, the larger crocodiles are not at present the most valuable commercially (Lever, 1980; Lever, 1982 cited in Groombridge, 1982; Whitaker, 1981 cited in Groombridge, 1982). Legislation in PNG (see below) forbids the sale of skins having a belly width of more than 20" (51 cm). Dixon *et al.* (in press) examined the sizes of skins imported by various skin dealers to Japan, and found that those from PNG varied in mean width from 17.8 cm in 1977 to 27.4 cm in 1984. In no year was the maximum skin size greater than 51 cm, indicating that the regulations in PNG are largely being adhered to. However the skins of *C. porosus* from Indonesia were much larger, varying in mean width from 46.4 cm in 1977 to 48.8 cm in 1984. The maximum skin size was 119.4 cm for a skin imported in 1984. This demonstrates that the hide hunting in Indonesia relies to a greater extent on the mature breeding adults, and is therefore far more damaging to the population recovery.

Collection of eggs and young for 'farm' rearing to marketable size poses a further threat to the species, when this is not accompanied by a suitable management programme. Several rearing farms operate in Indonesia (in Irian Jaya, Kalimantan and Java), dependant on eggs and young taken from wild populations (King *et al.*, 1979). In Kalimantan, for example, as the subadult and adult population became depleted to commercial exhaustion by hide hunting, pressure switched to eggs and young to be sold to rearing farms; most farms were closed by the mid-1970s as eggs and young could no longer be readily obtained (King *et al.*, 1979).

INTERNATIONAL TRADE There has been a steep decline in total world trade volume of *C. porosus* skins during the 1970s, from 100 000 per year to 20 000 per year, with prices rising at the same time (King *et al.*, 1979). However, demand for *porosus* hide continues and several commercial operations attempt to meet this, either through large-scale captive breeding (as at Samut Prakan) or through captive rearing, whereby hatchlings are taken from the wild and reared in captivity to a suitable size (Luxmoore *et al.*, 1985).

Minimum net trade in skins of *C. porosus* reported to CITES is shown in Table 1. Of the three regional populations now listed on Appendix II of CITES, that of Papua New Guinea has been so listed since 1979. Australia and Indonesia have been on Appendix I until 1985 when both were transferred to Appendix II. There has been no legal trade from Australia apart from a few skins exported in 1980, 1984 and 1985: the first exports from Australian farms. The number of skins reported to have originated in PNG (Table 2) shows fairly poor

Crocodylus porosus

Table 1 Minimum net imports of skins of *C. porosus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Austria	17	181	155	287	240	-
Australia	-	-	-	33	-	-
Canada	-	-	-	1	-	-
France	-	-	-	-	1392	2331
	-	-	-	-	14 m	351 m
Germany, F.R.	248	11327	501	490	29	3
Hong Kong	35	738	-	-	1	1
	10 m	-	-	-	-	-
Italy	890	2341	423	389	-	-
	-	66 kg	-	-	-	-
Japan	73	-	109	2050	2538	2414
Korea	9	-	-	25	-	-
Malaysia	-	60	-	-	-	-
Mexico	-	-	-	4 kg	-	-
PNG	-	1	-	-	-	-
Singapore	7	-	100	371	300	231
Spain	20	-	-	-	-	-
Switzerland	2003	551	772	1717	1044	216
Turkey	-	-	-	1	-	-
UK	89	130	57	34	-	362
USA	-	-	-	-	10	-
Total	3391	5134	2117	5398	5553	5758
	10 m	66 kg	-	4 kg	16 m	351 m

correlation with those elsewhere reported to have been exported (Table 3), due partially to the fact that PNG did not submit annual reports to CITES in 1981 or 1982. Indonesia has recorded an annual mean of 487 skins in 1980-1985, but there is apparently a substantial illegal trade (Luxmoore, 1986; Whitaker *et al.*, 1985; Anon., 1987); it is very likely that the large numbers of skins in reported trade with country of origin listed as Singapore or 'Unknown' also in fact originated in Indonesia. The number of skins said to have originated in Indonesia in Table 2 gives a very poor indication of the true volume of the trade, and this subject was examined in detail by Luxmoore (1986). Lever (1980) considered that about 10 000 skins were exported annually from Irian Jaya, around 10% of these being *C. porosus*. Dixon *et al.* (in press) examined the records of skin dealers in Japan and estimated the total numbers of skins of *C. porosus* imported into Japan directly from Indonesia and via Singapore to be 78, 1121, 1820, 1188, 1070, 207, 310 and 1402 in the eight years from 1977 to 1984 respectively. Similar imports from PNG over the same peiod were estimated at 1278, 3094, 3603, 3217, 2481, 2062, 2263 and 3436. However they pointed out that independant evidence from Japanese Customs import records indicated that the figures supplied by the dealers only accounted for between 5 and 48% of the total amount of crocodile skins imported from Indonesia over this period. Correlation between the dealers' and Customs data was much better for imports from Papua New Guinea (over 70%). If the imports from Indonesia are increased proportionately to take account of this discrepancy, they would vary from 1635 in 1977 to 2951 in 1984.

Table 2 Reported countries of origin (or exporting country if no origin reported) and quantities of transactions in skins of *C. porosus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries having wild populations of *C. porosus*.						
Australia	35	–	–	–	100	98
Indonesia	–	1160	126	345	200	1094
Malaysia	–	186	–	56	–	–
PNG	1803	3147	651	6315	6538	4266
	10 m	66 kg	–	4 kg	15 m	351 m
Singapore	1233	2504	606	3	74	74
Thailand	–	–	–	–	–	300
Countries without wild populations of *C. porosus*.						
Canada	–	–	–	–	3	–
France	1938	1084	–	–	–	–
Unknown	1205	2841	1470	537	46	–

Table 3: PNG exports according to Department of Primary Industry figures (Hollands, 1987).

1980	1981	1982	1983	1984	1985
5797	4281	4853	3456	5145	

There seems little doubt that the Australian population can withstand the moderate exploitation necessary for the planned ranching programme in Northern Territory (Webb *et al.*, 1985). The large numbers exported from PNG perhaps give some cause for concern, but harvesting does seem compatible with continued population recovery, given the clear evidence for the latter in the Sepik region (Hollands, 1984; 1987). On the contrary, the evidence for widespread and continued depletion of *C. porosus* in Indonesia, combined with reports of substantial illegal trade, suggest that harvesting here is not likely to allow any population recovery until appropriate management has been implemented (Whitaker *et al.*, 1985). Since 1985, a new management programme has been initiated with the assistance of FAO, but it is too early to say whether it has been effective.

CONSERVATION MEASURES Listed on CITES Appendix I with the exception of populations in Australia, Indonesia and Papua New Guinea, which are listed on Appendix II. Reservations with regard to Appendix I listing are held by Japan and Austria (reservations held by EEC countries, Italy and France, were withdrawn on 1 January 1984, and by Thailand on 17 August 1987). The protective legislation covering *C. porosus* through much of the range appears to be poorly enforced in most countries and with a continued demand for *porosus* hides, long-term survival of the species may depend on provision of strictly protected reserves, coupled with evolution of adequate management strategies where utilization is to continue.

The species is not protected in Burma, Palau Islands [Belau], Philippines, Thailand, Vanuatu. No information countries not listed below.

Australia Nominally protected by legislation in Australia (Western Australia, 1969; Northern Territory, 1971; Queensland, 1974) (Webb *et al.*, 1985). The Australian population of *C. porosus* was transferred from Appendix I to II in 1985 under the provisions of CITES Resolution Conf. 3.15 on ranching.

The species occurs in reserve areas in Australia, such as the Ord River Nature Reserve in Western Australia (A.A. Burbidge, *in litt.*, 5 February 1981) and a sizeable population exists in the 20 000 sq km Kakadu National Park in Northern Territory (Jenkins, 1979); this park now includes much of the East, South and West Alligator River systems and the Wildman River system (including the downstream reaches of all four) and is subject to an intensive campaign to control Water Buffalo.

Bangladesh Listed on Schedule 3 of the Wildlife (Preservation) (Amendment) Act, 1973, crocodiles may not be hunted, killed or captured. *C. porosus* occurs within the Sunderbans Tiger reserve.

India All crocodilians are listed in Schedule 1 of the Wildlife Protection Act, 1972, which confers the highest order of protection, but all states had to ratify the Act individually, and Kashmir and Assam had still not ratified the Act ten years later (Whitaker, 1987). The Government of India/FAO/UNDP Crocodile Breeding and Management Project has resulted in important conservation action. This scheme was initiated in 1975 with the dual aim of rehabilitating, depleted wild populations of India's three crocodilian species, and allowing the possibility of sustained utilization of wild or farmed crocodiles (Jayal, 1980; Saharia, 1981). The State Government of Orissa declared the entire remaining mangrove forest of the Brahmini-Baitarani delta (Bhitarkanika), comprising 176 sq. km, a sanctuary in May 1975. Fishing (a cover for crocodile poaching) was banned in the area in the same month, and felling of mangroves ceased in 1976. Eggs are collected from natural nests, incubated in captivity and the hatchlings reared to a size of 1 metre (Bustard and Choudhury, 1980). Other centres were set up at Port Blair, Andaman Islands, and the Sunderbans Tiger Reserve. A total of 408 *C. porosus* had been released up to 1984 (Whitaker, 1987). The species was extinct in Andhra Pradesh but the sanctuary was declared in July 1978 with the aim of re-establishing *C. porosus*, using hatchlings captive reared at Hyderabad from eggs from the Andaman Islands (Bustard and Choudhury, 1980).

Indonesia Nominally protected to some extent by legislation in Irian Jaya. The species is listed as protected in Irian Jaya (Law No 716/Kpts/Um/10/1980), in which hunting, except for capture for ranching purposes, is prohibited. Since November 1986, only processed skins may be exported. The Indonesian population of *C. porosus* was transferred from Appendix I to II in 1985, subject to an annual export quota of 2000 skins under the provisions of CITES Resolution Conf. 5.21. The quota was increased to 4000 in 1987.

Despite legal protection, illegal trade in crocodile skins from Irian Jaya is proceeding at an alarming rate; and illegal exports exceed by a large margin those officially authorised (Lever, 1980; Whitaker *et al.*, 1985; Luxmoore, 1986; Cox 1987; Anon., 1987; Dixon *et al.*, in press).

A management project, funded by FAO, has been initiated which hopes to establish a controlled harvest and ranching programme similar to that operating in neighbouring PNG (Cox, 1987). At the 6th meeting of the Conference to the Parties to CITES in 1987, an agreement was reached with the Japanese CITES Management Authority that all imports of crocodile skins from

Indonesia should be verified with the Indonesian Management Authority before they were allowed into Japan. Singapore, the other main importer, did not give such an undertaking.

C. porosus occurs in reserves on Siberut, Sumatra (Leuser Nat. Park) and Irian Jaya. Pulau Dolok Game Reserve is probably the most important crocodile area in Irian Jaya in that it provides good habitat for *C. porosus*, the rarer of the two Irian Jaya crocodiles (Lever, 1980).

Malaysia Sabah Crocodiles are on Schedule 1 of the Fauna Conservation Ordinance of 1963 (Amendment of 1 November 1982). They may only be killed in self-defence or under special permit for scientific purposes (Whitaker, 1984). Small populations may occur in Klias N.P. and in Crocker Range N.P. in Sabah (King *et al.*, 1979). Not protected in Sarawak.

Papua New Guinea The two indigenous crocodilians, *C. porosus* and *C. novaeguineae*, are utilized in a FAO/UNDP-aided scheme (FAO involvement ended 1982) whereby hatchlings are taken from the wild, reared in ranches. Hunting of wild animals is also allowed. It is claimed that the scheme not only maintains rural economies and counters urban drift, but also conserves wild crocodile populations since the hatchlings collected are considered a harvestable surplus and recruitment into the breeding segment, itself untouched, is able to continue. It appears that this programme has been relatively successful in managing the crocodile harvest. Populations of both *C. novaeguineae* and *C. porosus* have increased in thr Sepik River area. Crocodile management is controlled by the Crocodile Trade Ordinance, 1966 and the Crocodile Trade (Protection) Act. Hunting may only be carried out by land-owners or with their permission, but beyond that hunting is unregulated. Control is achieved by licensing those who wish to trade in skins. The selling of skins having a belly width greater than 20" (51 cm) or of less than 7" (18 cm) is prohibited. Smaller animals may be caught and traded live for sale to ranches, but they may not be killed for skin trade. All exports must be licensed (Hollands, 1987). The Japanese skin importers report that the great majority of skins from PNG fall within the legal size limits (Dixon *et al.*, in press), which indicates that there is little unregulated trade.

Sri Lanka Listed in Schedule IV of the Fauna and Flora Protection Ordinance, Ammendment. No. 44, November 1964, crocodiles may only be killed under special permit issued by the warden. Occurs in Yala and Wilpatu National Parks (Whitaker, 1986).

Thailand Not protected. Much former habitat near Ko Turutao in Thailand is within Turutao Marine National Park (Bain and Humphrey, 1980).

CAPTIVE BREEDING Breeds in ceptivity in suitable conditions, but few zoos keep adult pairs (Honegger, 1979). The species is currently being bred at the Samut Prakan commercial crocodile farm near Bangkok, Thailand, where about 1755 *C. porosus* were held in 1984 and a number of hybrids with *C. siamensis* (Luxmoore *et al.*, 1985). Animals are killed for their skin at around three years of age, and the meat is also sold. In 1979 it appeared (Lang, 1981 cited in Groombridge, 1982) that most *Crocodylus* breeding at Samut Prakan involved *C. siamensis*, and there was little or no *C. porosus* breeding. There is an experimental crocodile farm at Edwards River, Queensland, Australia, which was started in 1973, but which did not export its first commercial quantity of skins until 1985. There are three ranches in the Northern Territory, which take primarily eggs collected from the wild, and had a total stock of 2849 *C. porosus* in 1985. Most of the farms currently rearing *C. porosus* in PNG and Indonesia depend for their stock on hatchlings captured in the wild and there is little if any captive breeding. There are in the region of 11 farms operating in PNG, but the great majority of the

stock is held in only two large commercial farms. In 1983 the stock of *C. porosus* was estimated to be 9 000 (Luxmoore, *et al.*, 1985). The percentage of skins exported by the farms was small until 1983 but increased to around 50% of the wild harvest in 1984 (Hollands, 1987). There are currently 21 ranches in Indonesia which have a capacity of 20-30 000 head. The total stock of *C. porosus* was 5703 in 1987. It is estimated that annual production from these farms could rise to 15-20 000 in the next three years, of which 25% would be *C. porosus*. There is currently no captive-breeding, though this is planned (Anon., 1987). A ranching operation was established in Burma in 1978, taking eggs from the wild (Luxmoore *et al.*, 1985). It was reported to have a stock of around 1000 *C. porosus* in 1987, with an annual turnover of 300-500 crocodiles (S. Agarwal, *in litt.* to B. Bunting, 29 July 1987). Some farms in Singapore are keeping *C. porosus*; breeding programmes have been initiated (Luxmoore *et al.*, 1985), and have met with some success (Cox and Gombek, 1985). A farm at Kuching, Sarawak is reported to have been breeding *C. porosus* regularly since 1980, 38 clutches being produced up to October 1985 (Cox and Gombek, 1985). A large facility has recently been set up in the Philippines with the intention of breeding *C. porosus* (J.L. Diaz, *in litt.*, 8 December, 1986).

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ABBOTTS DAY GECKO

Recommended list: 2
[Possible problem]

Phelsuma abbotti Stejneger, 1893

Order SQUAMATA

Family GEKKONIDAE

SUMMARY AND CONCLUSIONS Found in the Seychelles (Aldabra and Assumption), and Madagascar, two subspecies have been characterised in the Seychelles and others are considered to exist in Madagascar. The estimated population size of *P. a. abbotti* is over 1 million specimens; there are no estimates for *P. a. sumptio*. An arboreal lizard, *P. abbotti* may be found in plantations and native forest. Threatened by loss of habitat on Assumption. Aldabra is a Strict Nature Reserve and the species may also occur in a reserve in Madagascar. Apparently breeds readily in captivity.

The minimum trade volume for the years 1980 - 1985 was 484 specimens, of which the majority, 247, were reported as dead specimens for scientific purposes. The remainder were live animals, presumably used for the pet trade. The principal exporters were the Seychelles and Madagascar. The UK, Italy, and the USA were the principal importers.

Exports in identified specimens of this species would probably not harm the population although additional data are needed to verify this. However, the Seychelles reported a large export of unidentified *Phelsuma* which, if they were *P. abbotti*, could adversely affect the status of certain populations. The restricted distribution of *P. a. sumptio* renders it particularly vulnerable to exploitation. Expert opinion favours maintaining trade controls.

DISTRIBUTION Known from the Seychelles and Madagascar.

Taxonomic note Three former subspecies of *P. abbotti* are now generally considered to be subspecies of *P. longinsulae*; i.e. *P. l. longinsulae, P. l. pulchra, P. l. menaiensis* (Cheke, 1982; 1984). All three are known from the Seychelles and Cheke (1982; 1984) summarized their distribution. *P. v-nigra* is sometimes treated as a subspecies of *P. abbotti* - here it is treated as a full species following Cheke (1984) and Mertens (1962). It is probable that *Phelsuma befotakensis* and *P. chekei* Borner and Minuth, 1984 from Madagascar should be referred to as subspecies of *P. abbotti* (Gardner, 1985). Borner and Minuth (1984) also considered that *P. a. sumptio* should be upgraded to *P. sumptio*; as they are apparently the only authorities to use this nomenclature, it is here maintained as a subspecies of *P. abbotti*.

Madagascar Mertens (1966) considered that the distribution of *P. a. abbotti* included Nossi Bé, and the north-west coast of Madagascar. It is likely however that specimens found here are uncharacterised subspecies other than *P. a. abbotti* (Cheke, 1982; 1984)

Seychelles *P. a. abbotti* is known from Aldabra Atoll (Cheke, 1984; Blanc, 1972). Found on all the major islands and many of the smaller ones (Gardner, 1985). *P. a. sumptio* is known from Assumption Island (Cheke, 1982).

POPULATION

Madagascar No information is available.

Seychelles *P. abbotti* has been found at densities of 100-200 individuals/ha in coconut groves, and at lower densities in native forest (Niedzwiedzi pers. comm. in Cheke, 1984).

P. a. abbotti: The entire population numbers over a million specimens at a conservative estimate. Highest densities are in mixed scrub vegetation and coconut trees (A.S. Gardner, *in litt.*, 23 January 1986).

P. a. sumptio: Abundant in coconut and *Casuarina* plantations, the population of this subspecies is now restricted following clear felling over much of the island. No detailed density estimates are available (A.S. Gardner, *in litt.*, 23 January 1986).

HABITAT AND ECOLOGY An arboreal lizard, *P. abbotti abbotti* is known from various forest types. A solitary species, breeding takes place throughout the year with eggs being deposited under bark in trees. The clutch size is typically two. (Niedzwiedzi in Cheke, 1984; Cheke, 1984).

The lizard is diurnal and feeds on insects, nectar from flowers and liquid from fruits (Niedzwiedzi in Cheke, 1984). A feeding association has been observed with giant tortoises (*Geochelone gigantea*) and the geckos forage on mosquitoes attracted to their soft parts and also insects disturbed by the tortoises' movement through the vegetation (Honneger, 1966; Stoddart and Wright, 1967). Predators have been identified as drongo (*Dicrurus aldabranus*), doves (*Streptopelia picturata*), herons (*Ardeidae* spp) and coucal (*Centropus toulou*) (Benson and Penny, 1971; Frith, 1979).

THREATS TO SURVIVAL Clear felling is taking place on Assumption Island for guano extraction and this is restricting the population of *P. a. sumptio* (A.S. Gardner, *in litt.*, 23 January 1986). No information has been found relating to exploitation of this species within the countries of origin.

INTERNATIONAL TRADE All *Phelsuma* species were originally included in CITES Appendix II as they were or could be subject to heavy pet trade and the species are difficult to tell apart. The only data on international trade are those contained in the Annual Reports of the Parties to CITES which are summarized in Tables 1 and 2.

Most of the reported trade was 247 dead specimens imported to the UK for scientific purposes. The remaining trade was in live animals, probably to be used as pets. Over the six years 1980-1985 inclusive, the Seychelles was the largest exporter of this species, followed by Madagascar. Most of the live animals were imported by Italy, followed by the USA and F.R. Germany.

Table 1: Minimum net imports of *Phelsuma abbotti* reported to CITES. All specimens were live except for 247 scientific specimens, indicated by #.

	1980	1981	1982	1983	1984	1985
Canada	-	-	2	-	-	-
Denmark	10	-	-	-	-	-
Germany, F.R.	-	15	-	30	-	-
Italy	-	-	-	-	100	-
UK	-	247 #	-	-	-	1 *
USA	-	61	18	-	-	-
Total	10	323	20	30	100	1

* Captive-bred

Phelsuma abbotti

Table 2: Reported countries of origin (or exporting country if no original source reported) and quantities of export of *Phelsuma abbotti* reported to CITES. All exports were live except for 247 scientific specimens, indicated by #.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having wild populations of *P. abbotti*						
Madagascar	-	-	-	-	100	-
Seychelles	-	247 #	20	30	-	-
	-	25				
Countries without wild populations of *P. abbotti*						
Comores	10	51	-	-	-	-
Germany, F.R.	-	10	-	-	-	-
Indonesia	-	-	-	-	-	1 *
USA	-	-	2	-	-	-

* Captive-bred

61 specimens were declared as having originated in the Comores, where *P.abbotti* does not occur; so it is possible that this is case of mistaken identity, in which case they could be *P. comorensis, P. dubia, P. laticauda, P. v-nigra*, (all species treated under this contract) or *P. robertmertensi*.

In addition to the trade in this species, the Seychelles reported exports of unidentified *Phelsuma* species. These are likely to be one of the following species: *Phelsuma astriata, P. abbotti, P. laticauda, P. longinsulae* or *P. sundbergi*. These exports were substantial and were as follows: 1980, 60 specimens; 1981, 1015 kg; 1982, 72 kg; 1983, 28 kg; 1984, 41 kg of bodies. The largest single importer of these was the United Kingdom. F.R. Germany and the USA also took large numbers. If these figures can be relied on and if all, or a substantial proportion, of these imports, were *P. abbotti*, this would be a cause for concern since they could make a great impact on wild populations. Using the maximum weight of *P. a. sumptio* (11.7 g), the total number of *Phelsuma* exported by the Seychelles in 1981 would be in excess of 85 000 animals, although only around 3% of this figure was exported in 1983, (2400 animals). It should be noted that no such shipments, nor even a substantial part of them, were reported as imports by other countries and it is possible that errors were made in the Annual Report of the Seychelles.

Due to lack of population and life history data it is not possible to assess the precise effects of international trade on this species. The reported trade in *P. abbotti* is not large and, if the specimens were *P. a. abbotti*, there would be little cause for concern, since the minimum population is estimated as one million. If the subspecies exported from the Seychelles was *P. a. sumptio*, which has a restricted distribution and is subject to pressure from logging, it will probably be less able to withstand the pressure. Gardner (*in litt.*, 1986) reports that *P. a. abbotti* is fully protected and not exploited and that *P. a. sumptio* is also not exploited. However, he considers that their handsome appearance combined with their rarity could make them attractive to collectors. Several experts have expressed reservations about the advisability of reducing the trade controls for *Phelsuma* (Q. Bloxam, *in litt.*, 1986; A.S. Gardner, *in litt.*, 23 January 1986; R. Thorpe, *in litt.*, 21 January 1986).

CONSERVATION MEASURES It is possible that this species occurs within the protected area of Lokobé on Nossi Bé (Madagascar). Aldabra is run by the Seychelles Island Foundation as a strict Nature Reserve which affords protection to *P. a. abbotti*. Gardner (*in litt.*, 1986) reports that *P. a. abbotti* and *P. a. sumptio* are not exploited.

CAPTIVE BREEDING. *Phelsuma abbotti* apparently breeds relatively easily in captivity. Jacobi (1982, unpublished data) reported that, in the Netherlands, 5 specimens were bred in 1980 and 11 in 1981. A recent inventory by Slavens (1985) did not report any specimens in captivity. There are however likely to be many.

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Recommended list: 3*
[No problem]

Phelsuma astriata Tornier, 1901

Order SAURIA Family GEKKONIDAE

*See last paragraph of Summary and Conclusions

SUMMARY AND CONCLUSIONS This species is endemic to and widespread in the Seychelles. Two widespread forms, *P. astriata astriata* and *P. a. semicarinata*, both appear to be abundant (numbering millions) and capable of living in a wide variety of natural and manipulated habitats. Two further subspecies, each on a single island, may be recogniseable. Present in a number of reserves in the Seychelles, this species is apparently relatively easy to breed in captivity.

The minimum trade volume reported to CITES during the period 1980-85 was 891 specimens, the majority of which comprised a single shipment of 537 dead specimens, imported to the UK for scientific purposes. Most of the remainder were reported as live exports from the Seychelles and the Comores. As the species does not occur in the Comores, there may have been a mistake over the identity. A large quantity of unidentified *Phelsuma* spp. were reported as exports from the Seychelles.

The volume of trade in lizards identified as *P. astriata* reported to CITES seems certain not to have significant adverse effects on population levels. However, the high number of unidentified *Phelsuma* reported as exports from the Seychelles could, if all or the great majority were *P. astriata*, have caused severe pressure on local populations; the inclusion in list 3 rests on the assumption that this is not the case. Further information on the identification and provenance of these lizards, and the veracity of the reported transactions, is required. Expert opinion favours maintaining trade controls.

DISTRIBUTION Endemic to the Seychelles. Cheke (1984) summarized the distribution as follows:
P. a. astriata: Mahé, Long, Saint Anne, Cerf, Conception, Thérèse, Cachee, Anonyme, Islette and Silhouette Islands (Cheke, 1984). Meier (1982) however additionally reported this subspecies from Praslin, Curieuse and La Digue.
P. a. semicarinata: St Joseph, D'Arros, Denis, Praslin, Curieuse, Round, La Digue, Felicité, Petite Soeur, Grand Soeur, Marianne, Cousin, Cousine, Aride (Cheke, 1984), Chauve Souris, Cocos (Thorpe, in Cheke, 1984).
Cheke (1984) recognises two further subspecies, *P. a. astovei* restricted to Astove Island (Blanc, 1972; Cheke, 1982; 1984) and '*P. a.* intermediate form' on Frégate; both these forms appear to be treated as *semicarinata* by others, such as Gardner (1985).

POPULATION

P. a. astriata: apparently abundant in most lowland habitat including coconut plantations and gardens, has been recorded at densities of up to 643 per 100 trees on Silhouette (the actual density probably being at least double this figure). The entire population must be numbered in millions (A.S. Gardner, *in litt.*, 23 January 1986).

P. a. semicarinata: Thorpe and Crawford (1979) and Evans and Evans (1980) found that the highest densities on Praslin were in native palm forest, with 225-250 individuals/ha. Gardner (*in litt.*, 23 January 1986), however,

reported densities of 400 per ha on Praslin. Cheke (1984) provided data for Cousin where there was a maximum density of 175 individuals/ha. Diamond (1976) reported that it was quite common there. The species may be excluded from coconut plantations to some extent by the larger *P. sundbergi*. The entire population is numbered in millions (A.S. Gardner, *in litt.*, 23 January 1986).

No information is available on the population size of *P. a. astovei* and the putative Frégate form; these are not likely to be large since both have a restricted distribution.

HABITAT AND ECOLOGY *P. a. semicarinata*: On both Praslin and Cousin, this arboreal subspecies is found in forests. Thorpe and Crawford (1979) found it in coconut groves, gardens, natural lowland forests, eroded hillsides (low densities) and hillside forest (highest density). It lives under bark in the trees and at the leaf bases (Evans and Evans, 1980). A diurnal subspecies, *P. a. semicarinata* feeds on insects (ants, bugs and beetles), spiders and nectar and pollen (Cheke, 1984). On Praslin, breeding takes place all year round and two eggs are laid under bark, in hollow rotting wood or in crevices of buildings. Approximately 10-12 eggs are laid per year (Gardner, 1984). No other information is available on the ecology of the other subspecies.

THREATS TO SURVIVAL None known. No information has been found relating to exploitation of this species within the Seychelles.

INTERNATIONAL TRADE. The whole genus *Phelsuma* was listed on CITES Appendix II as the species are difficult to separate. The only data on international trade are those contained in the Annual Reports of the Parties to CITES which are summarized in Tables 1 and 2. The majority of reported trade comprised a single shipment of 537 dead specimens, imported to the UK for scientific purposes. The remainder was in live animals, presumably for the pet market. Over the six years 1980-1985 inclusive, the Seychelles was the largest exporter of *P. astriata*, followed by the Comores, where the species does not occur. It is likely therefore that this is a case of mistaken identity, in which case they could be *P. comorensis*, *P. dubia*, *P. laticauda*, *P. v-nigra* or *P. robertmertensi*. The major importers of live animals were F.R. Germany and the USA. Of the 13 reported shipments, five involved the Netherlands as a re-exporting country and one as an exporting country.

Table 1: Minimum net imports of *Phelsuma astriata* reported to CITES. All figures represent live animals except for 537 dead specimens, indicated by #.

	1980	1981	1982	1983	1984	1985
Austria	-	-	-	10	-	-
Denmark	12	-	-	-	-	-
Germany, F.R.	10	58	99	90	-	-
Switzerland	-	-	2	-	-	-
UK	-	537 #	-	-	-	7 *
	-	20				
USA	-	46	-	-	-	-
Total	22	661	101	100	0	7

* Captive-bred

Phelsuma astriata

Table 2 Reported countries of origin (or exporting country if no origin reported) and quantities of export of *Phelsuma astriata* reported to CITES. All represent live animals except for 537 dead specimens, indicated by #.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having wild populations of *P. astriata*						
Seychelles	-	69	1	100	-	-
	-	537*				
Countries without wild populations of *P. astriata*						
Comores	12	55	100	-	-	-
Germany, F.R.	-	7	-	-	-	-
Indonesia	-	-	-	-	-	7 *
Madagascar	10	-	-	-	-	-
Netherlands	-	-	1	-	-	-

* Captive-bred

In addition to the trade in this species, the Seychelles reported exports of unidentified *Phelsuma* species. These are likely to be one of the following species: *Phelsuma astriata, P. abbotti, P. laticauda* (all species treated under this contract), *P. longinsulae* or *P. sundbergi*. These exports were substantial, reportedly mainly to the UK, F.R. Germany and USA and were as follows: 1980, 60 specimens; 1981, 1 015 kg; 1982, 72 kg; 1983, 28 kg; 1984, 41 kg bodies. However no country reports importing such shipments (or even a substantial part of them) and it is possible that errors exist in the Annual Report of the Seychelles to CITES. If these shipments took place, in 1981 tens of thousands of specimens would have been transported. If these were all, or a substantial part of them, *P. astriata*, populations could seriously have been depleted.

The levels of identified specimens of *P. astriata* in trade do not appear to be large enough to jeopardize the survival of this species. *P. a. astovei* and the Frégate form are most likely to be vulnerable to collections, since they have a restricted distribution. Gardner (*in litt.*, 23 January 1986) considered that this species could sustain a large export trade if managed sensibly. However, Thorpe (*in litt.*, 21 January 1986) observed that sustained and organised collection could threaten the species, particularly on small islands. Both considered that commercial trade should not be encouraged.

CONSERVATION MEASURES The following reserves on the Seychelles contain *P. astriata*: Cousin Island Special Reserve (managed by ICBP International), Aride Island (managed by the Royal Society for Nature Conservation), La Digue Veuve Reserve (on La Digue, managed by the Ministry of National Development), Morne Seychelles National Park (managed by the Ministry of National Development) and Vallee de Mai (on Praslin, a World Heritage Site).

CAPTIVE BREEDING *Phelsuma* spp. apparently breed relatively easily in captivity. Jacobi (1982, unpublished data) reported that in the Netherlands, 17 specimens were bred in 1980 and 26 in 1981. In a recent inventory, Slavens (1985) listed holdings of 3 specimens in two localities. There are however likely to be considerably greater numbers in captivity.

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GREATER DAY GECKO

Recommended list: 3
[No problem]

Phelsuma cepediana (Merrem, 1820)

Order SAURIA

Family GEKKONIDAE

SUMMARY AND CONCLUSIONS Found in Mauritius and introduced on Réunion, reports indicate that *P. cepediana* is abundant on Mauritius, numbering tens of thousands. Destruction of native forest habitat and cultivation may affect this species. Protected against capture, killing and export in Mauritius, this gecko may occur in nature reserves. Apparently readily bred in captivity.

CITES Annual Reports indicate a minimum net trade of 1608 *P. cepediana* in the period 1980-85; however only 180 specimens originated from Mauritius, the only country with a wild population. Other reported exports, from the Comores, Madagascar and the Seychelles, are likely to have been misidentified. The Netherlands, F.R. Germany and the USA were the major importers of *P. cepediana*.

The low level of reported trade before 1980, and the small number of specimens originating in Mauritius, suggests that trade in recent years has not been a significant threat to the species. Expert opinion does not favour relaxing trade controls on *Phelsuma*.

DISTRIBUTION This species is native to Mauritius and its islets (Blanc, 1972; Cheke, 1982; 1984; A.S. Gardner, *in litt.*, 23 January 1986; Rendahl, 1939) and introduced into Réunion (Cheke, 1975). Mertens (1963b) reported that 50 had been released at Ivoloina on the east coast of Madagascar.

POPULATION Although reported as localized and declining by Temple (1974), Owadally (Mauritius CITES MA, 1985) considered that it is the most abundant of the *Phelsuma* in Mauritius with a population of hundreds of thousands. *P. cepediana* was reported as the commonest and most widely distributed gecko on the island (Mertens, 1963a); probably relatively secure (Q. Bloxam, *in litt.*, 22 January 1986).

HABITAT AND ECOLOGY Commonest in upland vegetation including banana clumps and gardens, but also found at sea level (A.S. Gardner, *in litt.*, 23 January 1986). The species usually hides in trunk crevices, beneath bark or under sheltered branches. Eggs are usually laid in coupled pairs concealed in wood crevices or at the base of the leaf sheaths of monocotyledons (Vinson and Vinson, 1969)

THREATS TO SURVIVAL None confirmed; possibly affected by the large scale modification of native vegetation.

INTERNATIONAL TRADE *Phelsuma* spp. were listed on CITES Appendix II because it was likely that some species were or could be in international trade and the different species are difficult to identify. Temple (1974) reported that foreign dealers had expressed interest in the export of *Phelsuma* from Mauritius. The only data available on this trade are those contained in the Annual Reports of Parties to CITES which are summarized in Tables 1 and 2. All reported trade was in live animals, probably mostly for the pet market, although some were identified as being for zoological purposes. The Netherlands and F.R. Germany were the main importers, followed by the USA and Switzerland.

Table 1 Minimum net imports of live *Phelsuma cepediana* reported to CITES.

	1980	1981	1982	1983	1984	1985
Austria	–	–	–	12	–	–
Canada	–	–	–	–	–	3 *
Denmark	14	–	–	–	–	–
German D.R.	10	–	–	–	–	–
Germany, F.R.	90	237	181	26	–	12
Japan	–	–	–	8	4	–
Netherlands	–	–	–	–	–	524
South Africa	10	–	–	–	–	–
Switzerland	20	–	34	36	8	15
UK	–	20	2	–	–	–
USA	100	55	–	–	38	–
	–	–	–	–	54 *	98 *
Total	244	312	217	82	104	649

* Captive-bred

Table 2 Reported countries of origin (or exporting country if no origin reported) and numbers of live in *Phelsuma cepediana* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having wild populations of *P. cepediana*						
Mauritius	110	2	2	–	–	42
Countries without wild populations of *P. cepediana*						
Comores	14	110	215	86	3	500
Germany, F.R.	–	3	–	–	4 *	23 *
Indonesia	–	–	–	–	–	2 *
Madagascar	100	–	–	–	–	–
Netherlands	20	–	–	–	43	–
	–	–	–	–	50 *	76 *
New Zealand	–	–	–	–	4	–
Seychelles	–	50	–	–	–	–
Togo	–	–	–	4	–	–
Country unknown	–	150	–	–	–	–

* Captive-bred

The great majority of trade in *P. cepediana* was reported to have originated in the Comores, where the species does not occur. It is likely that the species was misidentified, possibly being *P. comorensis*, *P. dubia*, *P. laticauda*, *P. v-nigra* or *P. robertmertensi*. Similarly, the 100 specimens reported as originating from Madagascar in 1980 are likely to be species other than *P. cepediana*. Mauritius, where *P. cepediana* does occur supplied a total of 156 specimens over the period 1980–1985 (mostly in 1980

and 1985) to the USA, South Africa and the UK. 24 of the specimens in 1985 were identified on re-export from Switzerland as being for zoological purposes. Owadally (Mauritius CITES MA, 1985) considered that no export of *P. cepediana* from Mauritius now takes place. 21 of the 38 shipments during this period either originated from or were re-exported from the Netherlands.

The number of animals originating from Mauritius is unlikely to harm the population of *P. cepediana* since it is generally considered abundant. Systematic collecting could, however, pose problems and Bloxam (*in litt.*, 1986) and Gardner (*in litt.*, 1986) both consider that trade in *Phelsuma* should not be encouraged.

CONSERVATION MEASURES A law was enacted in 1973 to protect endemic reptiles from capture or killing and specifically forbids export from the island (Temple, 1974). *P. cepediana* was protected under the Wildlife Act No. 33 of 1933 (Mauritius CITES MA, 1987). Macchabee/Bel Ombre and Ile Plate are protected as nature reserves (Anon., 1985) and it is not inconceivable that *P. cepediana* occurs within these. Data are required on the ecology and life history of this species.

CAPTIVE BREEDING *Phelsuma* spp. apparently breed relatively easily in captivity. Jacobi (1982, unpublished data) reported that, in the Netherlands, 1 specimen was captive bred in 1972, 9 in 1973, 1 in 1976, 4 in 1977, 6 in 1978, 14 in 1979, 6 in 1980, 24 in 1981. Trade in captive-bred specimens reported to CITES in 1984 and 1985 indicates that breeding has occurred in the Netherlands and F.R. Germany. A recent inventory (Slavens, 1985) listed 21 specimens in 6 collections; the total numbers are likely to be much higher.

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Recommended list: 2
[Possible problem]

Phelsuma comorensis Mertens, 1966

Order SAURIA Family GEKKONIDAE

SUMMARY AND CONCLUSIONS Known only from Grande Comore, Comores Islands. No information on population size or ecology is available, this is urgently required. The restricted range is itself a cause for concern. Reputedly easily bred.

CITES Annual Reports indicate a minimum net trade of 1236 live specimens of *P. comorensis* and a further 222 unidentified *Phelsuma* in the period 1980-85, mostly from the Comores. F.R. Germany was the principal importer of this species (followed by the USA and Switzerland). Specimens were probably destined for the pet trade.

Although no assessment can be made of the precise effects of the exports on the wild population, trade in such a restricted species must give some cause for concern. Expert opinion does not favour relaxing trade controls on *Phelsuma*.

DISTRIBUTION Known from the island of Grand Comore, Comores Islands (Blanc, 1972; Mertens, 1966). Meier (1982) noted that the distribution extends from the type locality (La Grille at an altitude of 1000 m) to the north coast of the island.

POPULATION Said to be less common on the north coast than elsewhere (Meier, 1982), otherwise nothing known.

HABITAT AND ECOLOGY No information available.

THREATS TO SURVIVAL At risk due to the restricted range, and perhaps the effects of trade.

INTERNATIONAL TRADE All *Phelsuma* spp. were listed on Appendix II as it was likely that they were, or might be, in trade and the individual species are difficult to identify. The only data that are available are those contained in the Annual Reports of the Parties to CITES and these are summarized in Tables 1 and 2.

All reported trade was in live animals, presumably for the pet trade. Virtually all the exports were from the Comoro Islands, accounting for 97% of animals in trade over the period 1980-1985. The major importer was F.R. Germany, taking 77% of the animals, the USA imported 12% and Switzerland 8%; virtually all transactions were for commercial purposes.

The exports from the F.R. Germany probably originated from the Comores. It is likely that the exports from the Seychelles were not *P. comorensis* but one of the following: *P. astriata, P. abbotti, P. laticauda, P. longinsulae* or *P. sundbergi*.

In addition to the trade in this species, there were several reported imports to F.R. Germany and Austria from the Comores of unidentified *Phelsuma* species. These are likely to be one of the following species: *Phelsuma comorensis, P. dubia, P. laticauda, P. v-nigra* or *P. robertmertensi*. These were as follows: 1980, 150 specimens; 1981, 20; 1983, 20; 1984, 30, 1985, 2.

Table 1 Minimum net imports of live *Phelsuma comorensis* reported to CITES.

	1980	1981	1982	1983	1984	1985
Argentina	-	-	-	-	2	-
Austria	-	-	-	20	-	-
Canada	-	3	-	-	-	-
Denmark	10	-	15	-	-	-
Germany, F.R.	-	473	149	170	63	100
Japan	-	-	6	-	-	-
Switzerland	-	-	30	40	25	-
USA	2	82	-	60	10	-
Total	12	558	200	290	100	100

Table 2 Reported countries of origin (or exporting country if no origin reported) and numbers of live *Phelsuma comorensis* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having wild populations of *P. comorensis*						
Comores	10	536	200	290	100	100
Countries without wild populations of *P. comorensis*						
F.R. Germany	2	5	-	-	-	-
Seychelles	-	25	-	-	-	-

Since no information is available on the population status of this species, it is not possible to assess the effect of trade. However, the number of animals exported from the Comores should be viewed with concern given the very restricted range of this species.

CONSERVATION MEASURES Information on distribution, population status and ecology is required.

CAPTIVE BREEDING *Phelsuma* spp. are reputedly easily bred. However no information is available to suggest that this species has been bred in captivity. A recent inventory (Slavens, 1985) listed 5 specimens in 3 collections; there are however likely to be more.

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Recommended list: 3
[No problem]

Phelsuma dubia (Boetteger, 1881)

Order SAURIA Family GEKKONIDAE

SUMMARY AND CONCLUSIONS A widely distributed species occurring in the Comores, Mayotte, Madagascar, Mozambique and Tanzania. Little is known of the population status or life history of this species. Habitat destruction may threaten it in parts of its range. It may occur within the Lokobe Reserve on Nosy Bé in Madagascar.

Over the six years 1980-1985 inclusive, minimum net trade in *P. dubia* reported to CITES amounted to 1460 live animals. The Comores were the largest exporter and F.R. Germany was the principal importer.

It is not possible to indicate with certainty the effect that this trade has on the species since the population size is unknown. The level of recent trade does not appear excessive for such a wide-ranging gecko. Experts have warned against encouraging trade in *Phelsuma*.

DISTRIBUTION Known from Madagascar, the Comores, Mayotte, Tanzania (including Zanzibar) and Moçambique Island.

Comores Inhabits the islands of Grande Comore, Anjouan and Mohéli (Blanc, 1972; Mertens, 1966). Angel (1942) and Mertens (1966) listed localities.

Madagascar *P. dubia* may be found in the north-west, south-west, west and south-central regions as well as on the island of Nossi Bé (Angel, 1942; Blanc, 1972; Jenkins, 1987).

Mayotte Recorded from Mayotte (Mertens, 1966), a dependency of France.

Mozambique Recorded only from Moçambique Island (D.G. Broadley, *in litt.*, 18 March 1986).

Tanzania Recorded from Zanzibar and the mainland of Tanzania (Loveridge, 1957; Mertens, 1966).

POPULATION Apparently numerous around Majunga, Madagascar (Q. Bloxam, *in litt.*, 22 January 1986). No information is available for other parts of the range.

HABITAT AND ECOLOGY Observed on coconut palms in Majunga (Q. Bloxam, *in litt.*, 22 January 1986) and on tree trunks and fences on Moçambique Island (D.G. Broadley, *in litt.*, 18 March 1986). No further information is available.

THREATS TO SURVIVAL None known, but habitat destruction could presumably be a problem in certain parts of its range. No information has been found relating to exploitation of this species within the countries of origin.

INTERNATIONAL TRADE Listed on Appendix II of CITES as *Phelsuma* spp. were or were likely to be in trade and the species are difficult to differentiate. The only data available on trade are those contained in the Annual Reports of the Parties to CITES which are summarized in Tables 1 and 2.

Phelsuma dubia

Table 1 Minimum net imports of live *Phelsuma dubia* reported to CITES.

	1980	1981	1982	1983	1984	1985
Austria	-	-	30	12	-	-
Canada	2	-	-	-	-	12
Denmark	4	-	10	-	-	-
German D.R	20	-	-	-	-	-
Germany, F.R.	110	150	213	203	260	190
Japan	-	-	4	20	-	-
Spain	-	-	-	-	10	-
Surinam	-	-	3	-	-	-
Switzerland	10	10	30	-	-	-
UK	-	20	-	-	-	-
USA	-	60	2 *	-	30	10
	-	-	-	-	-	25 *
Total	146	240	292	245	300	237

* Captive-bred

Table 2 Reported countries of origin (or exporting country if no origin reported) and numbers of live *Phelsuma dubia* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having wild populations of *P. dubia*						
Comores	134	240	290	235	300	212
Countries without wild populations of *P. dubia*						
Czechoslovakia	-	-	2 + 2 *	-	-	-
Germany, F.R.	-	-	3	-	-	-
Indonesia	-	-	-	-	-	21 *
Mauritius	2	-	-	-	-	-
Netherlands	30	-	-	-	-	4 *
Sri Lanka	-	-	-	10	-	-

* Captive-bred

Over the six years 1980-1985 inclusive, minimum net trade in *P. dubia* amounted to 1460 live animals. The Comores were the largest exporter, accounting for 97% of total specimens exported. Exports from Czechoslovakia, F.R. Germany and the Netherlands were likely to have been re-exports or captive bred specimens. The principal importer was F.R. Germany.

In addition to the trade reported in this species, F.R. Germany and Austria reported imports from the Comores of unidentified *Phelsuma* species. These are likely to be one of the following species: *Phelsuma comorensis, P. dubia, P. laticauda, P. v-nigra* or *P. robertmertensi*. These were as follows: 1980, 150 specimens; 1981, 20; 1983, 20; 1984, 30; 1985, 2. In 1983,

Madagascar exported 32 live unidentified *Phelsuma* which could have included *P. dubia*.

It is not possible to assess the precise effect of trade on the populations of *P. dubia* in the absence of population data. The number of identified specimens together with the possible addition of unidentified *Phelsuma* does not appear to be great enough to jeopardise the security of *P. dubia*, given its extensive distribution. Bloxam (*in litt.*, 22 January 1986), however, warned against encouraging trade in *Phelsuma* as did Gardner (*in litt.*, 23 January 1986) and Thorpe (*in litt.*, 21 January 1986).

CONSERVATION MEASURES

Comores No information. Not a Party to CITES.

Madagascar All wildlife (except vermin) are protected under the Ordinance on hunting, fishing and the protection of Wildlife (3 October 1960). This provides for the requirement to obtain permits for the commercial hunting, possession, sale and of wildlife. It is possible that *P. dubia* occurs within the protected area of Lokobe on Nosy Bé (Jenkins, 1987).

Mayotte Mayotte is a dependency of France, intermediate in status between an Overseas Department and an Overseas Territory. It is not in the EEC, nor is it thought to be covered by the French ratification of CITES.

Tanzania Under the Wildlife Conservation Act, No. 12, 30 June 1974 (amended Act No. 21, 1978), all vertebrates are protected and may not be killed, captured, traded, imported or exported without a permit.

CAPTIVE BREEDING *Phelsuma* spp. are reputedly easily bred. Jacobi (1982, unpublished data) reported that, in the Netherlands, 6 were bred in 1977, 4 in 1978, 23 in 1979, 92 in 1980 and 89 in 1981. CITES Annual Reports indicate the export of captive-bred animals from Indonesia, the Netherlands and Czechoslovakia. A recent inventory (Slavens, 1985) reported only 1 specimen in captivity; this is likely to be an underestimate.

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GOLDDUST DAY GECKO

Recommended list: 3*
[No problem]

Phelsuma laticauda (Boettger, 1880)

Order SAURIA

Family GEKKONIDAE

*See last paragraph of Summary and Conclusions

SUMMARY AND CONCLUSIONS Widely distributed, occurring in the Comores, Mayotte, Madagascar and the Seychelles; observations indicate that *P. laticauda* is usually abundant. Habitat alterations could affect this gecko. Possibly occurring in a reserve on Madagascar, the species is reputedly easily bred.

Over the six years 1980-1985, minimum net trade in live *P. laticauda* reported to CITES amounted to 5356 specimens, most of which were in 1985. The largest exporter overall was the Comores, but in 1985, Madagascar exported 64% of all specimens. F.R. Germany, the USA, Switzerland, and latterly the Netherlands were the main importers.

The trade in *P. laticauda* does not appear to threaten populations of this species, particularly in view of its wide distribution. However, the high number of unidentified *Phelsuma* reported as exports from the Seychelles could, if it was correct and if all or the great majority were *P. laticauda*, have caused significant pressure on local populations. The increasing exports form Madagascar are probably not excessive at present, but might become so if they were to continue. Expert opinion favours maintaining controls on trade.

DISTRIBUTION A widely distributed species occurring in the Comores, Madagascar, Mayotte and the Seychelles (Blanc, 1972; Cheke, 1984).

Comores *P. l. laticauda* has been found on Anjouan (Blanc, 1972; Mertens, 1962). Rehndahl (1939) noted a subspecies, *P. l. comorensis*, not identified in later work.

Madagascar Both *P. l. laticauda* and *P. l. angularis* have been reported from Madagascar; the species appears to be widespread on the main island, also on Nosy Bé (Blanc, 1972; Mertens, 1964; Angel, 1942)

Mayotte *P. l. laticauda* has been found on Mayotte (Mertens, 1962).

Seychelles *P. l. laticauda* has been reported from Farquhar (Blanc, 1972; Cheke, 1984), Cerf (near Farquhar), Providence, St Anne and Cerf (Mahé group) (Cheke, 1984).

POPULATION Abundant in the coastal regions of north Madagascar and the Comores, reaching a high density (Gardner, 1984). Apparently numerous on Nosy Bé and Nosy Kamba (Q. Bloxam, *in litt.*, 22 January 1986; A.S. Gardner, *in litt.*, 23 January 1986). Density has reached 672 per 100 trees on Farquar; the species is abundant here, and on Providence (A.S. Gardner, *in litt.*, 23 January 1986).

HABITAT AND ECOLOGY Observed on buildings on the edge of degraded forest in Nosy Bé and Nosy Kamba (Q. Bloxam, *in litt.*, 22 January 1986).

THREATS TO SURVIVAL Habitat alterations are occurring within the range of this species and could conceivably affect it. No information is available to indicate that this species is subject to exploitation within the countries of origin.

INTERNATIONAL TRADE *Phelsuma* spp. were originally included on CITES Appendix II as they were or could be subject to heavy pet trade and the species are difficult to tell apart. The only data on international trade are those contained in the Annual Reports of the Parties to CITES.

Table 1 Minimum net imports of *Phelsuma laticauda* reported to CITES. All specimens are live except 29 bodies for scientific purposes, indicated by #.

	1980	1981	1982	1983	1984	1985
Argentina	–	–	–	–	2	2
Austria	–	–	30	32	10	40
Canada	2	–	–	–	–	17 +8*
Denmark	20	–	22	30	–	–
German D.R.	20	–	–	–	–	–
Germany, F.R.	70	670	382	770	469	1332
Japan	–	–	–	–	25	26
Netherlands	–	–	–	–	100	325
Spain	–	–	–	–	10	–
Suriname	–	–	6	–	–	–
Switzerland	50	10	40	60	53	25
UK	–	20 +29#	–	–	–	50
USA	102	170	–	10	131	178 +8*
Total	264	899	480	902	800	2011

* Captive-bred

Table 2 Reported countries of origin (or exporting country if no origin reported) and numbers of *Phelsuma laticauda* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having wild populations of *P. laticauda*						
Comores	20	870	480	892	650	700
Madagascar	90	25	–	–	150	1295
Seychelles	–	29 #	–	10	–	–
Countries without wild populations of *P. laticauda*						
Czechoslovakia	4	–	–	–	–	–
Germany, F.R.	–	–	6	–	–	15
Mauritius	2	–	–	–	–	–
Netherlands	70	–	–	–	25	16 *
Sri Lanka	–	–	–	–	10	–
Country unknown	100	–	–	–	–	–

* Captive-bred

Phelsuma laticauda

The great majority of reported trade was in live animals, presumably for the pet market. Over the six years 1980-1985, minimum net trade reported to CITES amounted to 5356 specimens, most of which were recorded in 1985. The largest exporter of *P. laticauda* overall was the Comores, but in 1985, Madagascar exported 64% of all specimens. The F.R. Germany was the largest importer of this gecko, the numbers imported remaining high over the whole period covered. The USA, Switzerland, and latterly the Netherlands were also significant importers.

In addition to the trade reported in this species, the Seychelles reported exports of large quantities of unidentified *Phelsuma* species. These are likely to be one of the following species: *Phelsuma abbotti, P. astriata, P. laticauda, P. longinsulae* or *P. sundbergi*. These exports, mostly to The UK, F.R. Germany and the USA, were as follows: 1980, 60 specimens; 1981, 1015 kg; 1982, 72 kg; 1983, 28 kg; 1984, 41 kg of bodies. The Comores also reported exports of unidentified *Phelsuma* species which are likely to be one of the following species: *Phelsuma comorensis, P. dubia, P. laticauda, P. v-nigra* or *P. robertmertensi*. These exports, mostly to F.R. Germany and Austria, were as follows: 1980, 150 specimens; 1981, 20; 1983, 22; 1984, 30; 1985, 2.

The export of unidentified *Phelsuma* from the Seychelles could cause concern if the figures can be relied on and if all, or a substantial number, were to be *P. laticauda*. The trade could amount to several tens of thousands of specimens in 1981 which could make an impact on the wild populations. It should, however, be noted that no such shipments were reported as imports by other countries and it is possible that errors were made in the Annual Reports of the Seychelles to CITES. The export of unidentified *Phelsuma* from the Comores would not cause such concern even if they were all *P. laticauda* since the numbers involved were relatively small.

The Golddust Day Gecko is apparently common over much of its extensive range, and therefore is unlikely to be deleteriously affected by the trade in this species which amounted to around 5356 specimens over six years. However, the recent substantial trade from Madagascar should be monitored and should the Seychelles trade in unidentified *Phelsuma* be predominantly *P. laticauda*, this could affect the wild populations there. Several experts have expressed reservations about the advisability of reducing the trade controls (Q. Bloxam, *in litt.*, 22 January 1986; A.S. Gardner, *in litt.*, 23 January 1986; R. Thorpe, *in litt.*, 21 January 1986).

CONSERVATION MEASURES

Comores No information. Not a Party to CITES.

Madagascar All wildlife (except vermin) are protected under the Ordinance on hunting, fishing and the protection of Wildlife (3 October 1960). This provides for the requirement to obtain permits for the commercial hunting, possession, sale and of wildlife. It is possible that *P. laticauda* occurs within the protected area of Lokobe on Nosy Bé (Jenkins, 1987).

Mayotte Mayotte is a dependency of France, intermediate in status between an Overseas Department and an Overseas Territory. It is not in the EEC, nor is it thought to be covered by the French ratification of CITES.

CAPTIVE BREEDING *Phelsuma* spp. are reputedly easily bred. Jacobi (1982, unpublished records) reported the following captive breeding success in the Netherlands: 1972, 1 specimen; 1973, 2 specimens; 1974 10 specimens; 1976, 4 specimens; 1977, 45 specimens; 1980, 79 specimens; 1981, 85 specimens. CITES

Annual Reports also indicate that captive-breeding is occurring in the Netherlands. A recent inventory (Slavens, 1985) reported 25 specimens of *P. laticauda* in 9 collections; the numbers are likely to be higher.

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Recommended list: 3
[No problem]

Phelsuma madagascariensis Gray 1831

Order SAURIA Family GEKKONIDAE

SUMMARY AND CONCLUSIONS Endemic to Madagascar, populations of this species occur over much of the island and the species seems to be abundant, at least in places. Known from forests, the loss of habitat by fire and for slash and burn cultivation could affect the status of this gecko. It may occur in the Réserve Naturelle Integrale de Lokobé on Nosy Bé.

The minimum net trade in *P. madagascariensis* reported to CITES from 1980 to 1985 amounted to 2189 live animals and 33 scientific specimens. Levels of trade remained low until 1984, when Madagascar, the only country which has wild populations of this species, reported exporting substantial quantities. The main importers were F.R. Germany, the USA and the Netherlands.

It is difficult to assess the significance of the trade, since nearly half of the specimens in trade appear to have been misidentified. The volume reported to CITES was not large, considering that the species is widespread in Madagascar, and it is unlikely to have any adverse effects on the populations. However the trade from Madagascar seems to be increasing and it should continue to be monitored. Expert opinion does not favour encouraging trade in *Phelsuma*.

DISTRIBUTION *P. madagascariensis* is endemic to Madagascar (Blanc, 1972) and appears to occur in most parts of the island (Angel, 1942).

POPULATION Little information is available on the population size of this species. In 1942, Angel reported that it was very common around Diego Suarez and frequent in the forests of the north-west. Bloxam (*in litt.*, 23 January 1986) considered that *P. m. kochi* and *P. m. grandis* could be fairly numerous.

HABITAT AND ECOLOGY South of Tamatave, *P. madagascariensis* is found in coastal regions . In the north-west it is known from forest (Angel, 1942). Bloxam (*in litt.*, 23 January 1986) observed *P. m. kochi* in the deciduous forest of Morandava and *P. m. grandis* in degraded forest on Nosy Bé.

THREATS TO SURVIVAL Vegetation destruction is likely to affect this species. Forest is disappearing for slash and burn cultivation and fire is also depleting the forest cover. Rice and manioc are being grown on Nosy Bé (Jenkins, 1987). No information has been found relating to exploitation of this species within Madagascar.

INTERNATIONAL TRADE Originally included on CITES Appendix II as *Phelsuma* spp. were or could be subject to heavy pet trade and the species are difficult to differentiate. The only data on international trade are those contained in the Annual Reports of the Parties to CITES (Tables 1 and 2).

The minimum net trade in *P. madagascariensis* reported to CITES from 1980 to 1985 amounted to 2189 live animals and 33 scientific specimens. Levels of trade remained relatively low until 1984, when Madagascar, the only country which has wild populations of this species, reported exporting substantial quantities. The specimens reported as being exported from the Seychelles may be *P. sundbergi* (formerly *P. madagascariensis sundbergi*); this Seychelles endemic is widespread and abundant (A.S. Gardner, *in litt.*, 23 January 1986). Specimens exported from the Comores are likely to have been

misidentified and could be one of the following: *P. comorensis, P. dubia, P. laticauda, P. v-nigra* or *P. robertmertensi*. The main importers of *P. madagascariensis* were F.R. Germany, the USA and the Netherlands.

Table 1 Minimum net imports of *Phelsuma madagascariensis* reported to CITES. All specimens were live except 33 scientific specimens, indicated by #.

	1980	1981	1982	1983	1984	1985
Austria	–	–	–	–	–	32 +3*
Canada	–	2	8	–	–	–
Denmark	16	–	2	–	17 *	–
Germany, F.R.	–	75	61	87	17	682
France	–	–	–	–	60	–
Japan	–	–	6	14	4	26
Netherlands	–	–	–	2	200	56
Sweden	–	–	–	4	–	–
Switzerland	2	–	16	34	14	15 +12*
UK	–	33 #	–	–	–	38
USA	44	54	72	8	30 +134*	162 +180*
Total	62	164	165	149	476	1206

* Captive-bred

Table 2 Reported countries of export (or exporting country if no origin reported) and numbers of *Phelsuma madagascariensis* reported to CITES. All specimens were live except 33 scientific specimens, indicated by #.

	1980	1981	1982	1983	1984	1985
Countries with wild populations of *P. madagascariensis*						
Madagascar	–	–	–	–	460	1169
Countries without wild populations of *P. madagascariensis*						
Austria	–	–	–	4	–	–
Comores	16	30	85	34	–	–
Czechoslovakia	7	–	–	–	–	–
Germany, F.R.	5	15	–	–	44 *	–
German D.R.	–	–	–	14	6 *	12 *
Guyana	–	–	–	4	–	–
Indonesia	–	–	–	–	–	12 *
Mauritius	20	–	–	–	–	–
Netherlands	–	–	–	4	107 *	168 *
Seychelles	–	103 +33*	80	103	–	–
USA	–	–	8	–	–	–
Country unknown	14	–	–	10	–	–

* Captive-bred

Phelsuma madagascariensis

It is difficult to fully assess the trade in this species, an endemic of Madagascar, since nearly half of the specimens in trade appear to have been misidentified. The volume reported to CITES not large, considering that the species is widespread in Madagascar, and it is unlikely to have any adverse effects on the populations. However the trade from Madagascar seems to be increasing and it should continue to be monitored. Bloxam (*in litt.*, 22 January 1986) considers that trade in *Phelsuma* should not be encouraged.

CONSERVATION MEASURES All wildlife (except vermin) are protected under the Ordinance on hunting, fishing and the protection of wildlife (3 October 1960). This provides for the requirement to obtain permits for the commercial hunting, possession, sale and export of wildlife. It is likely that this species occurs in the Réserve Naturelle Intégrale de Lokobe on Nosy Bé. (Jenkins, 1987).

CAPTIVE BREEDING *Phelsuma* spp. are reputedly easily bred. Jacobi (1982, unpublished data), reported that, in the Netherlands, 21 specimens were bred in 1972, 14 in 1978, 7 in 1979, 65 in 1980 and 97 in 1981. A recent inventory (Slavens, 1985) reported 111 specimens of *P. m. grandis* in 24 localities, 19 specimens of *P. m. kochi* in 4 locations, 1 specimen of *P. m. madagascariensis* in 1 location and 48 specimens of *P. madagascariensis* (subspecies unidentified) in 5 locations. This is likely to be an underestimate. CITES trade reports indicate that significant numbers may be being bred in the Netherlands and possibly also F.R. Germany.

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Recommended list: 3
[No problem]

Phelsuma v-nigra (Boettger, 1913)

Order SAURIA Family GEKKONIDAE

SUMMARY AND CONCLUSIONS Found in coastal regions of the Comores Islands and Mayotte; no data are available regarding status and life history. *P. v-nigra* may be affected by habitat destruction. Reputedly easily bred in captivity.

Minimum net trade in *P. v-nigra* reported to CITES amounted to 641 specimens. All trade was in live animals, presumably for the pet trade. The principal exporter was the Comores where 90% of the reported trade originated. Those specimens reported from Mauritius and the Seychelles are likely to be wrongly identified specimens since this gecko does not occur in either locality. F.R. Germany and the USA were the main importers.

Declared volume of trade is low and is unlikely to have a detrimental effect on the species as a whole, it is conceivable, however, that populations are locally affected. Expert opinion does not favour encouraging trade in *Phelsuma* spp.

DISTRIBUTION Known only from the Comores and Mayotte. *P. v-nigra* is sometimes considered a subspecies of *P. abbotti*.

Comores Known only from islands of Grande Comore, Anjouan and Mohéli (Blanc, 1972; Mertens 1966).

Mayotte Recorded from Mayotte (Mertens 1966).

POPULATION No information.

HABITAT AND ECOLOGY This species occurs in coastal regions up to altitudes of 300 m (Angel, 1942).

THREATS TO SURVIVAL Vegetation destruction is occurring and is particularly serious on Anjouan where extensive areas of the coastal zone have been cleared (Tattersall, 1977). No information has been found relating to exploitation within the Comores.

INTERNATIONAL TRADE The only data available are those contained in the Annual Reports of the Parties to CITES and are summarized in Tables 1 and 2.

Minimum net trade in *P. v-nigra* reported to CITES amounted to 641 specimens. All trade was in live animals, presumably for the pet trade. The principal exporter was the Comores where 90% of the reported trade originated. Those specimens reported from Mauritius and the Seychelles are likely to be wrongly identified specimens since this gecko does not occur in either locality. F.R.Germany and the USA were the main importers.

In addition to the trade in this species, imports of unidentified *Phelsuma* species were recorded from the Comores. These are likely to be one of the following species: *Phelsuma comorensis, P. dubia, P. laticauda, P. v-nigra* (all species treated under this contract) or *P. robertmertensi*. These imports, mostly to F.R. Germany and Austria, were as follows: 1980, 150 specimens; 1981, 20; 1983, 20; 1984, 30; 1985, 2. Should all the unidentified

Phelsuma v-nigra

Phelsuma spp. have been *P. v-nigra*, a possible addition of 222 specimens were in trade. The effect of this trade cannot be ascertained precisely since there are no data relating to population size or life history requirements. In view of the fact that this species is found on four islands, it is likely that there is no great impact on the species, although populations in accessible areas could be depleted. Bloxam (*in litt.*, 22 January 1986), Gardner (*in litt.*, 23 January 1986) and Thorpe (*in litt.*, 21 January 1986) all consider that trade in *Phelsuma* should not be encouraged.

Table 1 Minimum net imports of live *Phelsuma v-nigra* reported to CITES.

	1980	1981	1982	1983	1984	1985
Austria	-	-	-	2	10	-
Denmark	20	-	10	5	-	-
Germany, F.R.	-	48	110	123	-	80
Switzerland	30	-	20	29	-	-
UK	-	20	-	-	-	-
USA	12	112	-	-	10	-
Total	62	180	140	159	20	80

Table 2 Reported countries of origin (or exporting country if no origin reported) and numbers of live *Phelsuma v-nigra* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having wild populations of *P. v-nigra*						
Comores	20	160	140	159	20	80
Countries without wild populations of *P. v-nigra*						
Germany, F.R.	2	2	-	-	-	-
Mauritus	10	-	-	-	-	-
Netherlands	30	-	-	-	-	-
Seychelles	-	20	-	-	-	-

CONSERVATION MEASURES Information is required on the population status and ecology of this species.

Comores No information. Not a Party to CITES.

Mayotte Mayotte is a dependency of France, intermediate in status between an Overseas Department and an Overseas Territory. It is not in the EEC, nor is it thought to be covered by the French ratification of CITES.

CAPTIVE BREEDING *Phelsuma* spp. are reputedly easily bred. Jacobi (1982, unpublished data) reported that, in the Netherlands, 10 *P. v-nigra* were bred in 1978, 17 in 1979, 49 in 1980 and 35 in 1981. A recent inventory (Slavens,

1985), only reported one specimen in captivity; this is likely to be an underestimate.

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Recommended list: 3*
[No problem]

Chamaeleo bitaeniatus Fischer, 1884

Order SAURIA

Family CHAMAELEONIDAE

*See last sentence of Summary and Conclusions

SUMMARY AND CONCLUSIONS Widespread in eastern Africa from Ethiopia and Sudan south through Kenya and Uganda to Tanzania, possibly including Somalia and Zaire; no information is available on the population status of *C. bitaeniatus*. Little is known of the life history in the wild, some studies have been made on captive specimens. Apparently difficult to maintain in captivity and requiring special conditions. Possibly found within protected areas.

Trade in this species for the period 1980-83 was only reported in 1980 and 1981, Kenya being responsible for all exports (around 3500 in total) and the F.R. Germany and USA importing most specimens. Export from Kenya (and thus all reported trade) appears to have ceased since 1981, despite *C. bitaeniatus* not being listed on 1981 legislation which specifically banned export of three other Kenyan Chameleon species.

There is no evidence of the species, or local populations thereof, having been adversely affected by trade volumes as reported to CITES. Although unreported trade may exist, the known volume of international trade in the early 1980s is almost certain not to have been a significant problem. The inclusion in list 3 is dependent on Kenya maintaining her apparent ban on export of the species.

DISTRIBUTION Widespread; reported from Ethiopia and Sudan, south through Kenya, Uganda to north-west Tanzania (Loveridge, 1957; Mertens, 1966; Rand, 1963), possibly including Somalia and north-eastern Zaire.

Ethiopia Recorded from Addis Ababa, between Sancurrar and Amarr, and between Badditu and Oime (Rand, 1963).

Kenya Most Kenyan records are from the Rift Valley and adjacent areas as far as Mt Elgon in the West (Rand, 1963; J. Hebrard, *in litt.*, 1 April 1986).

Somalia Although Loveridge (1957) reported that the distribution of *C. b. bitaeniatus* included Somalia, Rand (1963) indicated that the only record from Somalia (Coronna) was doubtful. Simonetta and Magnoni (1986) did not list the species from Somalia.

Sudan Recorded from the *Podocarpus* forest on Mt Kinyeti in the Imantong Mountains (Böhme and Klaver, 1980).

Tanzania Restricted to Longido West (Rand, 1963; K.M. Howell, *in litt.*, 15 March 1986).

Uganda Loveridge (1957) reported that the distribution of *C. b. bitaeniatus* extended from Ethiopa and Kenya "south through Uganda". Rand (1963) recorded no specimens from Uganda, but included some from the Kenyan side of Mt Elgon. The locality in the Imantong Mountains of Sudan (Böhme and Klaver, 1980) is close to Uganda's northern border.

Zaire Howell (*in litt.*, 15 March 1986) noted that this species occurred in north-eastern Zaire, but no other records have been located in the literature.

POPULATION No information available. This species is said to be small and extremely cryptic (J. Hebrard, *in litt.*, 1 April 1986), and so may be overlooked.

HABITAT AND ECOLOGY A small and extremely cryptic chameleon. Occurs in grasslands, with or without scattered bushes, and attains high population density in stands of *Acacia drepanolobium* (where ants form the main prey) (J. Hebrard, *in litt.*, 1 April 1986).

A viviparous species; 3-4 broods may be produced per year, each with around 17 young (Bustard, 1966; Schmidt and Inger, 1957; de Vosjoli, 1979). The gestation period is not accurately known, but is at least three months. Both males and females tend to have a regular perch for basking and spending the night.

THREATS TO SURVIVAL None known other than capture for the live animal trade.

INTERNATIONAL TRADE The only data available on international trade are those contained in Annual Reports of the Parties to CITES which are summarized in Table 1.

Table 1 Minimum net imports of live *Chamaeleo bitaeniatus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Germany, F.R.	1460	474	-	-	-	-
Switzerland	90	35	-	-	-	-
UK	-	57	-	-	-	-
USA	500	1010	-	-	-	-
Total	2050	1576	0	0	0	0

All specimens reported in trade were live, suggesting that they were intended for the pet trade. Trade only occurred in 1980 and 1981 and all reported exports originated in Kenya. The F.R. Germany and USA were the principal importers of this chameleon, taking 53% and 42% of the total imports, respectively .

Although no trade in this species took place after 1981, prior to that date, the reported trade did not seem unduly high in view of the extensive distribution of this species. Specimens were however taken from only a limited part of the total range. Since population and life history data are lacking, it is not possible to assess the true impact on wild populations.

CONSERVATION MEASURES Unless otherwise stated, all of the information on protection is from IUCN Environmental Policy and Law Occasional Paper No. 3, *African Wildlife Laws*.

Ethiopia Under the Wildlife Conservation (Amendment) Regulations, 12 February 1974, Chameleons are classified as game, and may only be captured by licensed trappers and dealers under a Game Capture Permit, the value of which was set as Eth$0.10 per animal.

Kenya Kenya has prohibited the export of three other species of chameleon, but these do not include *C. bitaeniatus*. There are several protected areas where this species may occur including the National Parks at Lake Nakuru, and Mt Kenya.

Somalia A ban on all hunting was instituted on 13 October 1977.

Sudan Chameleons are not listed in the Ordinance for the Preservation of Wild Animals, 1935 (Amended 1974), as species for which hunting is permitted. Licences are only required if firearms are used for hunting. The Hides and Skins (Export) Regulations, 1969, specify a grading system for the export of reptile skins.

Tanzania Under the Wildlife Conservation Act, 30 June 1974, the capture of all live animals requires a valid capture permit, and the hunting of all animals requires a valid hunting permit.

Uganda No reptiles, other than crocodiles, are protected.

Zaire The commercial capture of unprotected animals requires a permit under the Hunting Act, 28 May 1982. Export can only be authorised if the exporter holds a certificate of lawful possession.

CAPTIVE BREEDING Chameleons are reputedly difficult to keep in captivity over long periods. De Vosjoli (1979) provided details of suitable breeding conditions, particularly regarding temperature, humidity, lighting, cage size and layout and feeding; see also Bustard (1966). Formerly maintained at the Chameleon Research Center (de Vosjoli, 1979); this centre no longer exists. A recent inventory (Slavens, 1985) does not record any individuals in live collections, although there are likely to be some.

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Recommended list: 3*
[No problem]

Chamaeleo gracilis Hallowell, 1842

Order SAURIA

Family CHAMAELEONIDAE

*See last sentence of Summary and Conclusions

SUMMARY AND CONCLUSIONS A wide-ranging species, extending across tropical Africa from Senegal east to Somalia, and south to Zaire and Tanzania. Present in Angola, Equatorial Guinea (Bioko), Cameroon, Central African Republic, Congo, Ethiopia, Gabon, Gambia, Ghana, Guinea, Ivory Coast, Kenya, Liberia, Nigeria, Senegal, Sierra Leone, Somalia, Sudan, Tanzania, Uganda, Zaire, and possibly Benin, Togo, Chad and Mali. Little information is available on the life history and population status of *C. gracilis*. An insectivore which prefers open country, international trade is the only known possible threat. Breeding can occur in captivity, but chameleons are reputedly difficult to maintain.

Declared trade in the period 1980-85 was only reported in 1980, 1981 and 1985 and amounted to a total of around 2200 specimens. The principal importers were the USA and F.R. Germany. Kenya was responsible for the export of 77% of all specimens exported in 1981 and 1982, but then the Kenyan export ceased following legislation to prohibit trade. Tanzania and Togo were the main suppliers in 1985.

It is unlikely that the relatively low volume of trade declared up to 1981 had a deleterious affect on the species, although in the absence of population and life history data this cannot be stated with certainty, and it is possible that populations were affected locally. International trade cannot be regarded as a significant threat to the species, provided that there is no appreciable unreported trade and that the Kenyan export ban remains effective.

DISTRIBUTION A very wide-ranging species, *C. gracilis* extends across tropical Africa from Senegal east to Somalia, and south to Zaire and Tanzania. Present in Angola, Equatorial Guinea (Bioko), Cameroon, Central African Republic, Congo, Ethiopia, Gabon, Gambia, Ghana, Guinea, Ivory Coast, Kenya, Liberia, Nigeria, Senegal, Sierra Leone, Somalia, Sudan, Tanzania, Uganda, Zaire (Loveridge, 1957; Mertens, 1966; Schmidt 1919), and possibly Benin, Togo, Chad and Mali (Groombridge, 1983). The nominate form *C. g. gracilis* occupies most of the range, giving way to *C. g. etiennei* in Gabon, Congo, Zaire and Angola (Mertens, 1966).

Angola *C. g. etiennei* has been recorded from Angola (Mertens, 1966; Laurent, 1964).

Benin Not recorded by Mertens (1966), although as it occurs in nearby countries, Nigeria and Ghana, it might be expected to occur there and was listed by Groombridge (1983). Loveridge (1957) pointed out that it had not been recorded from Dahomey.

Cameroon *C. g. gracilis* was recorded by Mertens (1966).

Central African Republic *C. g. gracilis* was recorded by Mertens (1966).

Chad Listed as present by Groombridge (1983), but no record has been located.

Chamaeleo gracilis

Congo Both *C. g. gracilis* and *C. g. etiennei* were recorded from Congo (Brazzaville) (Mertens, 1966). Loveridge (1957) stated that *C. g. gracilis* had not been recorded from the French Congo.

Djibouti Groombridge (1983) listed the species as probably occurring in Djibouti, but this seems unlikely as in neighbouring Somalia it appears to be confined to the south (Simonetta and Magnoni, 1986).

Equatorial Giunea *C. burchelli*, listed as a synonym of *C. g. gracilis* by Mertens (1966), was recorded from Fernando Poo (Bioko), although Mertens did not include either the island or the mainland of Equatorial Guinea in his distribution.

Ethiopia *C. g. gracilis* was recorded by Mertens (1966).

Gabon Both *C. g. gracilis* and *C. g. etiennei* were recorded from Gabon (Mertens, 1966).

Gambia Recorded by Hakansson (1981).

Ghana *C. g. gracilis* was recorded by Mertens (1966).

Guinea *C. g. gracilis* was recorded by Mertens (1966).

Ivory Coast *C. g. gracilis* was recorded by Mertens (1966).

Kenya Occurs in two different habitats in Kenya: arid thorn scrub and semi-desert; and well watered agricultural land in western Kenya (J.L Hebrard, *in litt.*, 1 April 1986).

Liberia *C. g. gracilis* was recorded by Mertens (1966).

Mali Listed as present by Groombridge (1983), but no record has been located.

Nigeria *C. g. gracilis* was recorded by Mertens (1966). Butler and Shitu (1985) described traditional uses of the species in Nigeria.

Senegal *C. g. gracilis* was recorded by Mertens (1966).

Sierra Leone *C. g. gracilis* was recorded by Mertens (1966).

Somalia Recorded from Middle Shebelle, Mogadishu, Lower Shebelle, Bay, Gedo and Lower Juba, all in southern Somalia (Simonetta and Magnoni, 1986).

Sudan *C. g. gracilis* was recorded by Mertens (1966).

Tanzania Found only at Longido and Mt Meru in northern Tanzania (K.M. Howell, *in litt.*, 15 March 1986).

Togo Not recorded by Mertens (1966), although as it occurs in nearby countries, Nigeria and Ghana, it might be expected to occur there, and was listed by Groombridge (1983).

Uganda *C. g. gracilis* was recorded by Mertens (1966).

Zaire Both *C. g. gracilis* and *C. g. etiennei* were recorded from Zaire (Mertens, 1966) Lanza and Vanni (1976) recorded *C. g. gracilis* from the north.

POPULATION Virtually no information is available on the population size of this animal. Marked population fluctuations have been noted in dry parts of the range (J. Hebrard, *in litt.*, 1 April 1986).

Congo *C. gracilis* is said to be very abundant in the country (Congo CITES MA, 1986).

Kenya In Tsavo National Park, for example, the habitat may become uniformly saturated with young animals when they hatch during the short rains (around November); most of these subsequently die and only a few isolated adults may remain by the time of the long rains (April). The species was said to be extremely rare in Kora National Reserve in 1984 (J. Hebrard, *in litt.*, 1 April 1986).

Sudan Schmidt (1919) reported that *C. gracilis* was abundant in the east.

HABITAT AND ECOLOGY Apparently an inhabitant of open country, although occasionally recorded from forest (in Cameroon and Liberia) (Schmidt, 1919). The species occurs in two distinct habitats in Kenya; in well-watered agricultural land in western Kenya, and in arid thorn scrub and semi-desert in other parts of the country (J. Hebrard, *in litt.*, 1 April 1986). Lanza and Vanni (1976) recently collected specimens in a savannah habitat in Zaire.

This species deposits its eggs in a hole dug in the ground. The eggs are laid when the rainy season is ending and hatching occurs before the next rains (Menzies, 1958). Schmidt (1919) reported that *C. g. gracilis* lives chiefly on Orthoptera and that *C. g. etiennei* feeds on a variety of insects especially grasshoppers, crickets, cockroaches and flies.

THREATS TO SURVIVAL Butler and Shitu (1985) reported that the Yorubas in Nigeria use various parts of *C. gracilis* in tribal medicine. They also believe that stepping in the excreta causes elephantiasis. In Congo, the only use is said to be in traditional medecine (Congo CITES MA, 1986). No exports are said to have originated in Uganda, and the chief threat is thought to be from fires in the dry season (Uganda Game Department, *in litt.*, 28 March 1987).

INTERNATIONAL TRADE The only available data are those provided in the Annual Reports of the Parties to CITES which are summarized in Tables 1 and 2. This species was only reported in trade in 1980, 1981 and 1985. The principal importers were the USA and F.R. Germany. The specimens imported by the G.D.R. in 1980 were re-exports from the F.R. Germany. Kenya was responsible for the export of 77% of all specimens exported in 1981 and 1982, but then the Kenyan export ceased following legislation to prohibit trade. Tanzania and Togo were the main suppliers in 1985.

Table 1 Minimum net imports of live *Chamaeleo gracilis* reported to CITES.

	1980	1981	1982	1983	1984	1985
Germany, F.R.	350	230	-	-	-	370
German D.R.	30	-	-	-	-	-
UK	300	34	-	-	-	-
USA	375	503	-	-	-	5
Total	1055	767	0	0	0	375

Chamaeleo gracilis

Table 2 Reported countries of origin (or exporting country if no origin reported) and numbers of live *Chamaeleo gracilis* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries having wild populations of *C. gracilis*						
Ghana	300	-	-	-	-	5
Kenya	755	692	-	-	-	-
Tanzania	-	-	-	-	-	250
Togo	-	-	-	-	-	120
Country unknown	-	75	-	-	-	-

Exports until 1985 were not so large as to cause concern for the overall status of this species, however, populations in accessible regions could be affected. The precise effects of trade in this species cannot however be ascertained since population and life history data are lacking.

CONSERVATION MEASURES Unless otherwise stated, all of the information on protection is from IUCN Environmental Policy and Law Occasional Paper No. 3, *African Wildlife Laws*.

Angola Apparently not protected.

Benin Chameleons are not protected.

Cameroon Under the Forests, Wildlife and Fisheries Act, 27 November 1981, bag limits are set for the hunting of all species.

Central African Republic The Ordinance concerning the protection of wildlife and regulating hunting, 27 July 1984, does not list chameleons, but all wildlife species may only be taken by customary hunters or by the holders of hunting licences.

Chad No information.

Congo The Act concerning the conservation and exploitation of wild fauna, 21 April 1983, vests in the State ownership of all wild animals of economic value, and requires the issuing of licences for commercial capturing.

Ethiopia Under the Wildlife Conservation (Amendment) Regulations, 12 February 1974, Chameleons are classified as game, and may only be captured by licensed trappers and dealers under a Game Capture Permit, the value of which was set as Eth$0.10 per animal.

Gabon The Wildlife and Forests Act, 22 July 1982 requires the issuing of licences for the commercial capture of all wildlife. Traditional hunting for subsistence pruposes is permitted.

Gambia Under the Wildlife Conservation Act, 14 February 1977, all wildlife except game and vermin are protected.

Ghana The Wildlife Conservation Regulations, 4 March 1971, define all wildlife, other than protected species, as game animals and establish hunting restrictions.

Guinea No information.

Guinea-Bissau The Hunting Regulations, 12 May 1980, require the issuance of a licence for the capturing of live wild animals.

Ivory Coast Chameleons are not specifically listed in the Wildlife and Hunting Act, 4 August 1965, but Arrêté No. 15, 26 December 1972, establishes licence fees for the capturing of all live reptiles.

Kenya Kenya has prohibited the export of *C. gracilis* unless the written permission of the Minister for Environment and Natural Resources is obtained (Legal Notice 152, 25 September, 1981).

Liberia Apparently not protected.

Mali A general hunting ban (Decree 325/PG-RM) throughout the country was imposed on 6 November 1978.

Nigeria Apparently not protected.

Senegal The Game and Wildlife Protection Regulations, 30 May 1967, lay down regulations governing the issuance of licences for hunting and commercial capturing of wildlife.

Sierra Leone Apparently not protected.

Somalia A ban on all hunting was instituted on 13 October 1977.

Sudan Chameleons are not listed in the Ordinance for the Preservation of Wild Animals, 1935 (Amended 1974), as species for which hunting is permitted. Licences are only required if firearms are used for hunting. The Hides and Skins (Export) Regulations, 1969, specify a grading system for the export of reptile skins.

Tanzania Under the Wildlife Conservation Act, 30 June 1974, the capture of all live animals requires a valid capture permit, and the hunting of all animals requires a valid hunting permit.

Togo Apparently not protected.

Uganda No reptiles, other than crocodiles, are protected.

Zaire The commercial capture of unprotected animals requires a permit under the Hunting Act, 28 May 1982. Export can only be authorised if the exporter holds a certificate of lawful possession.

CAPTIVE BREEDING Menzies (1958) described the breeding behaviour of this chameleon in captivity and reported that a captive specimen laid 45 soft shelled eggs, which hatched after 219 days. De Vosjoli (1979) provided guidance on the care, breeding and maintenance of the African chameleons, which are difficult to maintain over a long period of time. Formerly kept at the Chameleon Research Center (Riva, 1979); this centre no longer exists. A recent inventory (Slavens, 1985) reported that three specimens were maintained in two collections. This is likely to be an underestimate.

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Recommended list: 3*
[No problem]

Chamaeleo hoehnelii Steindachner 1891

Order SAURIA

Family CHAMAELEONIDAE

*See last sentence of Summary and Conclusions

SUMMARY AND CONCLUSIONS Found in upland areas of Kenya and Uganda, *C. hoehnelii* is known to be abundant in some areas and thrives in areas of dense human habitation. An inhabitant of forest edges and low shrubby vegetation, this viviparous species may produce around 14 young twice a year. Probably occurring within some protected areas, no specific threats to this species are known. It will breed regularly under correct conditions but is reputedly difficult to maintain in captivity for any length of time.

The only reported trade in the period 1980-85 was in 1980, 1981 and 1985 and totalled some 12 700 specimens; 90% of these were recorded as origin Kenya. Export from Kenya appears to have ceased since 1981, despite *C. hoehnelii* not being listed on 1981 legislation which specifically banned export of three other Kenyan Chameleon species.

The legal status of this species in Kenya should be determined. It is possible that the relatively high volume of trade recorded in 1980 and 1981 could have led to local depletions, but if, in addition to the apparent cessation of reported trade since 1981, there has been no appreciable unreported trade, international trade is most unlikely to pose a significant threat to the species.

DISTRIBUTION Known from Kenya and Uganda.

Kenya Loveridge (1957) reported it from the highlands of Kenya. Rand (1963) listed localities in south-western Kenya between 1660 m and 3050 m.

Uganda Loveridge (1957) reported it from the highlands of eastern Uganda (Mt Elgon). Rand (1963) listed localities between 1220 m and 3350 m.

POPULATION The species may be extremely abundant in some suitable habitats (J. Hebrard, *in litt.*, 1 April 1986). Abundant at Karatina (Kenya) (Lin and Nelson, 1981). Apparently increasing in the Aberdare range in Kenya, where it may be displacing *C. jacksonii* (Riva, 1979). No data are available for other parts of its range.

HABITAT AND ECOLOGY Restricted to well watered upland habitats above about 1600 m; may be extremely abundant in forest edges, hedgerows and in ornamental vegetation - appears to thrive in areas of dense human habitation (J. Hebrard, *in litt.*, 1 April 1986). Known at altitudes up to 11 000 feet (3350 m) on the west slope of the Mt Elgon and above 3000 m in the Aberdare range (Rand, 1963; Hebrard *et al.*, 1982). Found in the tree heath zone immediately below the alpine zone in the Aberdare mountains (Loveridge, 1935); at Karatina (Kenya), found principally in small localized areas of open secondary scrub and rarely on trees over 2 m high (Lin and Nelson, 1981). Hebrard *et al.* (1982) found this species inhabiting shrubs in bushland.

Females mature at approximately 9.5 months old and males about one month later (Lin and Nelson, 1981). This viviparous species breeds throughout the year, females producing 2 litters of young a year in the wild. The average litter size is 13.7 and newborn young measure less than 30 mm SVL. Mean longevity

for females is 2.3 years. (Lin and Nelson, 1981). Young take insects (Bustard, 1965). Frequently basks on trees (Lin and Nelson, 1981). Shows particular adaptations to the low temperatures typical of high altitude (Bustard, 1965; Hebrard *et al.*, 1982).

THREATS TO SURVIVAL None known other than trade (see below).

INTERNATIONAL TRADE The only data on international trade are those contained in the Annual Reports of the Parties to CITES which are summarized in Tables 1 and 2. All reported trade was in live animals.

Table 1 Minimum net imports of live *Chamaeleo hoehnelii* reported to CITES.

	1980	1981	1982	1983	1984	1985
Denmark	10	-	-	-	-	-
Germany, F.R.	2146	1455	-	-	-	-
German D.R.	50	-	-	-	-	-
Switzerland	154	140	-	-	-	-
UK	25	107	-	-	-	-
USA	3975	4640	-	-	-	25
Total	6360	6342	0	0	0	25

Table 2 Reported countries of origin (or exporting country if no origin reported) and numbers of live of *Chamaeleo hoehnelii* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having wild populations of *C. hoehnelii*						
Kenya	6060	5417	-	-	-	-
Countries without wild populations of *C. hoehnelii*						
Germany, F.R.	2	-	-	-	-	-
Mozambique	-	-	-	-	-	25
Country unknown	300	925	-	-	-	-

Trade in this species was only reported for the years 1980, 1981 and 1985. During this period, Kenya was the largest exporter of *C. hoehnelii*, accounting for 90% of all specimens reported in export, although no Kenyan specimens were reported after 1981. The USA and F.R. Germany were the largest importers taking 68% and 28% respectively of the total imports.

The trade volume reported to CITES in 1980 and 1981 is relatively large, however, it seems most unlikely that this could have any significant effect on the species in view of its frequent abundance (including around human habitation). Trade could perhaps reduce populations in easily accessible areas. There has been no recent trade in the species other than a single shipment from Mozambique, where the species does not occur.

CONSERVATION MEASURES There are several protected areas where this species may occur. These include the National Parks at Lake Nakuru, Mt Elgon and Mt Kenya. Additional data are required on the population status of this species.

Kenya Kenya has prohibited the export of three other species of chameleon, but these do not include *C. hoehnelii*.

Uganda No reptiles, other than crocodiles, are protected.

CAPTIVE BREEDING This species apparently breeds regularly in the correct conditions and Angel (1933) and Bustard (1965) reported live births of captive specimens. Chameleons are however difficult to maintain in captivity for a long time and suitable environmental conditions have to be produced. De Vosjoli (1979) described the care and conditions required for breeding. A recent inventory (Slavens, 1985) did not record any collections of this species, but did note that some had existed.

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THREE-HORNED CHAMELEON

Recommended list: 2*
[Possible problem]

Chamaeleo jacksonii Boulenger, 1896.

Order SAURIA

Family CHAMAELEONIDAE

* The category has been changed from 3 to 2 since approval by the CITES TEC Committee meeting in 1986.

SUMMARY AND CONCLUSIONS Inhabits highland regions in Kenya and Tanzania; one of the two subspecies, *C. j. merumontanus*, is found only at Mt Meru in Tanzania. Little information is available on population status. An ovoviviparous species, producing around 22 young once a year. The Three-horned Chameleon probably occurs within several protected areas and is export from Kenya is prohibited. Apparently difficult to maintain in captivity for any length of time, captive breeding has taken place.

Recorded trade in this species in the period 1980-85 only took place in 1980, 1981 and 1985, and amounted to c. 26 600 specimens. It appears to have been the most heavily traded *Chamaeleo* species in 1980/81. At that time, 91% of the number in trade were recorded as originating in Kenya. The only trade since then has been from Tanzania, and may therefore be of *C. j. merumontanus*. Most specimens were imported by the USA and F.R. Germany. Kenyan legislation (enacted in 1981) appears to have effectively stopped its exports.

It is not possible to assess the impact of previous trade on the overall population status since detailed population data are lacking. Local populations in accessible areas could have been affected but the species as a whole is most unlikely to be significantly threatened by trade, providing, firstly, that Kenya's protective legislation continues to be implemented, and secondly, that there is no appreciable unreported trade. The subspecies *C. j. merumontanus* is particularly vulnerable due to its restricted distribution. As its only known range (Mt Meru) is a game reserve, it is difficult to see how any could have been legally acquired. The recent trade from Tanzania is therefore of greater concern.

DISTRIBUTION Inhabits highlands in Kenya and Tanzania. Two subspecies are recognised, *C. j. jacksonii* being endemic to Kenya and *C. j. merumontanus* to Tanzania.

Kenya *C. j. jacksonii* occurs in the uplands from Mt Kenya south to Nairobi (Loveridge, 1957; Mertens, 1966; Rand, 1958). It also occurs in the Aberdare range and around Karatina (Lin and Nelson, 1981; Riva, 1979b).

Tanzania *C. j. merumontanus* is only known from Mt Meru, Tanzania, where it has been found at altitudes of 7500 - 9000 feet (Rand, 1958). Loveridge (1957) stated that *C. j. jacksonii* also occurred in Tanzania, but Rand (1958) pointed out that this was incorrect, the only specimen from Tanzania being correctly attributable to *C. j. merumontanus*.

POPULATION No information is available on the overall status of this species. Density can be very high locally, in various secondary habitats as well as in native forest (J. Hebrard, *in litt.*, 1 April 1986).

Kenya Abundant around Karatina, Kenya, in 1981 (Lin and Nelson, 1981). Said to be disappearing from the Aberdare mountain range due to over-collecting and a population explosion of *C. hoehnelii* (Riva, 1979b).

Tanzania The population of *C. j. merumontanus* is likely to be very limited due to its restricted range.

HABITAT AND ECOLOGY A comparatively large species of chameleon, inhabiting highland areas up to 2000 m (de Vosjoli, 1979a). Occurs primarily in forest and former forest, but also in coffee plantations where some original trees have been left standing, and in stands of ornamental or exotic trees, and in hedges in Nairobi (J. Hebrard, *in litt.*, 1 April 1986). Around Karatina *C. jacksonii* occurred predominantly in woodlands mixed with herbs and shrubs particularly above 2 m, and rarely in thick undergrowth. Bushes were the principal perch site (Lin and Nelson, 1981). On Mt Meru, *C. j. merumontanus* was found in bushes and in low trees (Rand, 1958).

This species is ovoviviparous (Lawrence, 1985). Females mature at around 13.5 months and males 3 months later. Copulation has been observed from March to May, parturition occurring from mid January to March. The average litter size is around 22 animals, the new born ranging from 25-32 mm SVL. Birth takes place during the period of maximum insect abundance (Lin and Nelson, 1981).

THREATS TO SURVIVAL An increase in numbers of *C. hoehnelii* is said to be reducing numbers of *C. jacksonii* in the Aberdares. Apparently heavily exploited in the Aberdares by collectors for the pet trade (Riva, 1979b).

INTERNATIONAL TRADE The only information available on the international trade are data contained in the Annual Reports of the Parties to CITES which are summarized in Tables 1 and 2.

All the figures represent live specimens primarily in trade for commercial purposes, suggesting that they were destined for the pet trade. Kenya was the chief exporting country over the years 1980-1981, exporting 24 345 specimens, 91% of the total in trade. The majority of these chameleons were exported in 1980. The principal importing countries were the USA and F.R. Germany, accounting for 73% and 24% respectively of all imports reported in 1980 and 1981. The Netherlands re-exported a total of 190 specimens which originated largely from Kenya. De Vosjoli (1979b) reported that this is the most frequently imported chameleon (to the USA).

Table 1 Minimum net imports of live *Chamaeleo jacksonii* reported to CITES.

	1980	1981	1982	1983	1984	1985
Argentina	6	7	-	-	-	-
Austria	-	10	-	-	-	-
Canada	174	35	-	-	-	-
Denmark	10	-	-	-	-	-
Germany, F.R.	4681	1595	-	-	-	250
German D.R.	60	-	-	-	-	-
Italy	-	12	-	-	-	-
Japan	-	13	-	-	-	-
Switzerland	224	135	-	-	-	-
UK	50	600	-	-	-	-
USA	12491	6580	-	-	-	-
Total	17696	8997	0	0	0	250

Chamaeleo jacksonii

Table 2 Reported countries of origin (or exporting country if no origin reported) and numbers of live *Chamaeleo jacksonii* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having wild populations of *C. jacksonii*						
Kenya	17130	7215	-	-	-	-
Tanzania	-	-	-	-	-	250
Countries without wild populations of *C. jacksonii*						
Germany, F.R.	7	-	-	-	-	-
Thailand	4	-	-	-	-	-
Country unknown	510	1735	-	-	-	-

Relatively large numbers have been reported in trade, however, the overall effect on the species is most unlikely to be significant. It is not inconceivable that numbers of the species could be reduced in accessible areas. No trade from Kenya has been reported since 1981. The only trade since then has been from Tanzania, and may therefore be of *C. j. merumontanus*. Since this sub-species has such a restricted distribution, it could be particularly vulnerable to any trade. As its only known range (Mt Meru) is a game reserve, it is difficult to see how any could have been legally acquired.

CONSERVATION MEASURES Data are required on the population status of this species.

Kenya The Aberdare Mountain range is a National Park. Kenya has prohibited the export of this species without written permission from the Minister for Environment and Natural Resources (under Legal Notice 152 enacted on 25 September 1981).

Tanzania Under the Wildlife Conservation Act, No. 12, 30 June 1974 (amended Act No. 21, 1978), all vertebrates are protected and may not be killed, captured, traded, imported or exported without a permit. Mount Meru is protected as a Game Reserve.

CAPTIVE BREEDING De Vosjoli (1979b) produced guidelines on the care, maintenance and breeding of the African chameleons, which are apparently difficult to maintain in captivity. This included information on feeding, lighting, temperature, humidity and environment. *C. jacksonii* requires large enclosures. Formerly maintained at the Chameleon Research Center (Riva, 1979a); this centre no longer exists. A recent inventory (Slavens, 1985) reported six specimens in three collections. This may be an underestimate. It is the only chameleon to have been bred over three generations (Lawrence, 1985).

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GREEN IGUANA

Recommended list: 2*
[Possible problem]

Iguana iguana (Linnaeus, 1758)

Order SAURIA

Family IGUANIDAE

* The category has been changed from 3 to 2 since approval by the CITES TEC Committee meeting in 1986 owing to the increasing levels of trade in 1985.

SUMMARY AND CONCLUSIONS Extremely widespread in Latin America, *I. iguana* is adaptable and found in a great variety of habitats from Mexico and the West Indies to Paraguay. It is large, up to 45 cm snout-vent length, almost exclusively herbivorous and principally arboreal, being found particularly along the margins of rivers. Sexual maturity is reached at an age of 2-3 years, and broods, averaging 35-40 eggs, hatch at the beginning of the wet season. Most population data are available for Central American and Caribbean countries, where the species is said to be depleted in many areas, chiefly by intense hunting for meat and eggs, and also habitat destruction. In mainland South America hunting pressure seems to be less severe, except in Colombia, and populations may be less affected.

Although formerly traded in small quantities for skins, the main international trade is now primarily for live animals as pets, 109 000 being reported in 1985. The main source countries were El Salvador and Guatemala. There is substantial cross-border trading in Central America of iguanas for human consumption, but this is mostly illegal, and is unlikely to be affected by CITES. There is a low level of international trade in skins.

The main countries currently recorded as supplying live animals to international trade, El Salvador and Guatemala, both have depleted populations of Iguanas. Few data are available for South America, but it seems that populations are not under threat, except possibly in Colombia. In Central America the major threat is from internal trade for food, which is outside the control of CITES, but the current level of international trade in live animals from this region seems likely to be exacerbating the problem.

DISTRIBUTION Widespread in the Neotropics from Mexico to Paraguay, including many Caribbean Islands. On mainland South America *I. iguana* is widely distributed in most lowland areas north of the Tropic of Capricorn. The highest altitude record is from 1000 m in Colombia (Etheridge, 1982). Lazell (1973) has been followed in not recognising any subspecies, although some authorities consider that the form on the South American mainland is different from that occurring in the Antilles.

Aruba Recorded from the island (Lazell, 1973).

Belize Highly localized, as much of the habitat is unsuitable (Fitch *et al.*, 1982).

Bolivia Widespread, including the Amazonian region (Hoogmoed, 1979)

Brazil Widespread in Amazonia (Hoogmoed, 1979) and the Pantanal, and throughout north-east and central Brazil as far as Bahia (Cunha, 1961)

British Virgin Islands Including Tortola (Etheridge, 1982), although this population may now be extinct, Peter Island and Virgin Gorda (UK CITES MA, 1986).

Colombia Widespread on the mainland, including the Amazonian region (Hoogmoed, 1979); and including the islands of Gorgona, Providencia, San Andrés and Santa Catalina (Lazell, 1973; Gallego 1978).

Costa Rica Found mostly in the lowlands in the dry, north-western part; it is limited to gallery forests along streams (Fitch *et al.*, 1982).

Dominica The early record from Dominica (Boulenger, 1885) is probably erroneous (Lazell, 1973).

Ecuador Widespread from the coast (Lazell, 1973) to the Amazonian region (Hoogmoed, 1979)

El Salvador Chiefly in the coastal mangrove forests (Fitch *et al.*, 1982).

French Guiana Occurs throughout the country (Hoogmoed and Lescure, 1975).

French West Indies Including the arid, leeward coast of La Guadeloupe, especially abundant on the Iles du Pigeon ou Goyave, and the Iles des Saintes on La Coche, Grande Ilet, central and eastern Terre de Haut and Ilet-a-Cabrit, but absent from Marie Galante, La Désirade and surrounding small islands (Lazell, 1973).

Grenada Including the islands of Kick-'em-Jenny, Mabouya Cay, Isle-a-Caille, Isle-a-Ronde, Carriacou, but probably extinct on Glover Island (Lazell, 1973).

Guatemala Chiefly in the Caribbean lowlands (Fitch *et al.*, 1982).

Guyana Widespread (Hoogmoed, 1979).

Honduras Occurs on both coasts, but is most abundant in the warm, humid Caribbean lowlands (Fitch *et al.*, 1982); including Las Islas de la Bahia (Utila, Roatan and Guanaja) (Etheridge, 1982), Half Moon Cay and the Swan Islands (Lazell, 1973).

Mexico Occurring southwards from about 24° 30' on the Pacific coast and 21° 30' on the Atlantic coast, in the states of Campeche, Chiapas, Colima, Durango, Guerrero, Jalisco, Mexico, Michoacan, Morelos, Nayarit, Oaxaca, Puebla, Quintana Roo (including Cozumel Island), Sinaloa, Tabasco, Tamaulipas, Veracruz and Yucatan (Smith and Smith, 1976), although it is rare in Yucatan (Etheridge, 1982).

Montserrat Locally abundant in the South (Lazell, 1973).

Netherlands Antilles Recorded from Bonaire, Klein Bonaire, Curaçao and, in the Leeward Islands, Saba (Lazell, 1973).

Nicaragua Widely distributed, but occurs mainly on the Caribbean coast and along major rivers (Fitch *et al.*, 1982); also recorded from the Corn Islands (Lazell, 1973).

Panama Including the Archipelago de Las Perlas (Etheridge, 1982).

Paraguay Confined to the Chaco (Etheridge, 1982).

Peru Widespread, including the Amazonian region (Hoogmoed, 1979). Recorded from Iquitos, the Rio Napo or upper Maranon (Dixon and Soini, 1986).

Iguana iguana

Puerto Rico Mostly in the San Juan area, but there may also be a population near Trujillo Alto; also recorded from Isla Magueyes, Cayo Icacos and Whistling Cay (Schwartz *et al.*, 1978).

St Lucia Found chiefly on the north-eastern coast of the main island; but probably extinct on Pigeon Island (Lazell, 1973), and absent from the Maria Islands (Corke, 1987).

St Vincent Throughout the lowlands and coastal cays, and including the islands of Bequia, Quatre, Battowia, Petite Mustique, Mustique, Petit St Vincent, Union Island, Frigate Cay, Tobago Cays, Cannouan and Savan (Lazell, 1973).

Suriname Occurs throughout the country in a wide variety of habitats, from sea level to at least 500 m (Hoogmoed, 1973).

Trinidad and Tobago Occurs on both islands (Lazell, 1973).

US Virgin Islands Including St Croix, but absent from the small cays of the St Croix bank (Lazell, 1973), occurring on St Thomas, St John, Water Island, Patricia Cay and Hassel Island (Etheridge, 1982).

Venezuela Found in most mainland regions (Rivero-Blanco and Dixon, 1979); and including the islands of Margarita, Los Testigos, Los Frailes, Los Hermanos, La Blanquilla, La Tortuga, Orchilla, Los Roques, Isla Aves (Lazell, 1973). Widespread in lowland habitats, from primary forest to arid areas, and up to the splash zone along rocky coasts, even adapting to live in parks and gardens (S. Gorzula, *in litt.*, 11 April 1986).

POPULATION Most population data are available for Central American and Caribbean countries, where numbers are said to be declining in many areas. There are few data for mainland South America, but there are no suggestions that the populations are declining, except in Colombia.

Aruba No information.

Bolivia No information.

Brazil Said to be extremely common around all major waterways (W.E. Magnusson, pers. comm.).

British Virgin Islands The population on Tortola is said to be greatly reduced or extinct; Peter Island has a healthy but small population; and Virgin Gorda has a small population in the North Sound area at Bird Creek (UK CITES MA, 1986).

Colombia Populations of *I. iguana* are thought to be declining in Colombia as a result of over-hunting (Harris, 1982). The populations in the islands of San Andrés and Providencia are said to "much persecuted" (Gallego, 1978). On Isla Gorgona, iguanas are scarce, but can still be seen without much difficulty, although they are very abundant on Isla Gorgonilla (Medem, 1979).

Costa Rica As in Nicaragua, populations are thought to be scarce or declining rapidly except in areas too remote from settlements to be hunted regularly (Fitch *et al.*, 1982).

Ecuador No information.

El Salvador The populations of *I. iguana* which once thrived in the coastal mangrove forests are reported to have almost disappeared as the

forests have been destroyed. Although iguanas were still relatively common in 1974, the forests have now been reduced to 1% of their original area, and, within remaining stands, iguana populations may be as low as 1% of their original density. Iguanas are reported to be still surviving in the area around Volcan San Miguel, although they are probably mostly *Ctenosaura similis* (Fitch *et al.*, 1982).

French Guiana No information.

French West Indies On the Iles des Pigeons, Guadeloupe, it was especially abundant; on Saba it was everywhere common, and on St Croix it was locally abundant in the East End District, while the Iles des Saintes were said to be infested with iguanas (Lazell, 1973).

Grenada *I. iguana* is said to be rare (Ministry of Agriculture and Tourism, *in litt.*, 15 November 1985).

Guatemala Both hunting and habitat destruction are reported to have contributed to a "drastic reduction" of iguana populations (Fitch *et al.*, 1982). Populations in Alta Verapaz are reported to have declined as a result of over-hunting (Flores Villela, 1980), but Fitch *et al.* (1982) assert that they have been little affected in Alta Verapaz and Peten, on the Caribbean coast. They report that the worst affected areas are on the Pacific coast where the coastal mangrove forests have been reduced to 7% of their original extent by agricultural development. The increasing use of pesticides has also been implicated.

Guyana No information.

Honduras Most of the country, particularly the North, is sparsely populated and iguana populations are not in danger of extermination or even of drastic reduction, however around Choluteca in the Pacific lowlands the population may have been reduced by as much as 90% (Fitch *et al.*, 1982).

Mexico *I. iguana* is reported to have declined in numbers as a result of hunting, and is generally considered to be endangered in Mexico (G. Ceballos, *in litt.*, 2 December 1986). In the coastal mangrove forests of Chiapas, most of the animals captured are adolescents and juveniles, and the population is estimated to be as low as 5% of its original size (Fitch *et al.*, 1982). Northwards from Chiapas, up the Pacific coast to Sinaloa, *I. iguana* is still relatively common and substantial populations have been reported in Jalisco and Colima (G. Ceballos, *in litt.*, 2 December 1986). On the gulf coast and in parts of the Yucatan Peninsula there were reported to be substantial populations (Fitch *et al.*, 1982). Huerta and Mondragon (1975) reported that iguanas had declined enormously in Tabasco, particularly around Villahermosa and Teapa.

Montserrat No information.

Netherlands Antilles *I. iguana* is said to have declined in recent years on Curacao (Bakhuis, 1983).

Nicaragua Drastic reductions in numbers were reported in many areas, particularly towards the South of the Pacific coastal strip, although there it was probably *Ctenosaura similis* which was worst affected. In many of the country's sparsely populated areas, iguanas were thought to be somewhere near their original abundance (Fitch *et al.*, 1982).

Panama Evidence from the volumes of iguanas sold in markets suggests that their populations declined markedly between 1950 and 1969 (Fitch *et al.*,

1982). Werner (1986) reported that they had disappeared from several areas owing primarily to over-hunting.

Paraguay No information.

Peru Said to have become extremely rare around Iquitos, supposedly because of over-hunting (Dixon and Soini, 1986).

Puerto Rico No information.

St Lucia Said to be "extremely rare in St Lucia" although "little is known about their status in the wild" (Corke, 1983).

St Vincent No information.

Suriname *I. iguana* is reported to common and is not considered to be endangered (Kalden, C.J., *in litt.*, 16 January 1986).

Trinidad and Tobago At least locally common in 1973 (Lazell, 1973).

US Virgin Islands No infromation.

Venezuela Said to be common in spite of the hunting pressure which may be severe in the north of the country (S. Gorzula, *in litt.*, 11 April 1986). In April, after the young have hatched, the Llanos are reported to be inundated with iguanas, which even spread into areas of human habitation (Ramo and Ayarzaguena, 1983).

HABITAT AND ECOLOGY A large, herbivorous lizard, *Iguana iguana* is sexually dimorphic, the maximum size in males being about 3.8 kg, 45 cm snout-vent length (SVL) and 1.9 kg, 34 cm in females (Dugan, 1982). It occurs in a very wide variety of habitats, usually favouring river banks and the margins of ponds and lakes, but also found in arid or rocky areas with xeromorphic vegetation. Ceballos (*in litt.*, 2 December 1986) noted that sparse populations occurred in sugar cane crops and along water ditches in other cultivated areas. It is described as "primarily arboreal and strongly heliothermic". Adults spend most of their time perched in trees, but younger animals often bask on the ground during the day, returning to the vegetation only at night. It is reported to be relatively sedentary, some animals never moving far from the site of hatching (Dugan, 1982; Van Devender, 1982).

Juveniles hatch at a length of 72-79 mm SVL (Harris, 1982). Van Devender's (1982) studies of growth rate indicate a linear increase in SVL with age for the first two years of life, reaching 180 mm after one year and 290 mm after two. Sexual maturity in females is achieved after two or three years when they attain a length of over 200 mm (Wiewandt, 1982). Eggs are laid in burrows, usually in sandy soil, the clutch size being reported to vary from 14 to 76, with the mean between 35 and 40. Egg weights vary from 9 g to 14 g (Wiewandt, 1982). Incubation has been found to last for 74 to 81 days at 31°C (Harris, 1982). Mating is relatively synchronous throughout the population, and occurs in the dry season, hatching taking place at the beginning of the wet season. This pattern has been reported to be common to populations throughout most of the geographic range, and is thought to ensure not only that a flush of new vegetation is available for the hatchlings but also that the soil temperatures at the end of the dry season are high enough for incubation (Rand and Greene, 1982). Some nests are communal, up to eight females sharing the same deep, branching burrow. This allows for the deeper burial of the eggs, which are often extremely difficult to locate as a result (Rand and Dugan, 1984). Repeated nesting at the same site may help to maintain loose soil structure and keep the vegetation clear. Females have been reported to guard nests after

laying has been completed (Wiewandt, 1982). Males defend mating territories and females tend to select the larger males (Dugan, 1982). They may copulate with more than one male (Dugan and Wiewandt, 1982). After reaching maturity, females may breed annually to an age of ten years (Rand and Greene, 1982). The oldest recorded *Iguana iguana* reached 12 years, 5 months in captivity in Florida (Bowler, 1977).

Survival of hatchlings is very low, 75% dying in the first three months and 50% dying in each of the next three 3-month periods, with not less than 2.6% of the original hatchlings surviving at the end of one year (Harris, 1982). Van Devender (1982) provides a similar mortality model.

Adult *I. iguana* are exclusively herbivorous, feeding primarily on leaves of trees, but fruits and other vegetation are also taken. It has been reported that there is an ontogenetic shift in diet, the juveniles being carnivorous, but this is now thought to be incorrect, even the juveniles being herbivorous (Hoogmoed, 1973; Van Devender, 1982). Instead, young animals have been shown to satisfy their higher requirements for protein and energy compared to adults by selecting better quality vegetation (Troyer, 1984a). Lazell (1973) observed *I. iguana* eating birds eggs. Food undergoes microbial fermentation in the specially enlarged hind-gut, 30-40% of the total metabolisable energy being obtained from this source (McBee and McBee, 1982). The overall digestive efficiency (54% for fibre and 86% for protein) is comparable with values found in ruminants (Troyer, 1984b).

The chief predator of *I. iguana* is undoubtedly man, but *Basiliscus basiliscus* is also locally important. Other predators include the reptiles *Boa constrictor, Crocodylus acutus, Ctenosaura similis* and *Trimorphodon biscutatus*, the birds *Sarcorhamphus papa, Elanoides forficatus, Quiscalus* spp., and *Philander opossum, Felis pardalis* and other large cats and domestic dogs amongst the mammals (Hoogmoed, 1973; Van Devender, 1982; Dugan *et al.*, 1981; G. Ceballos, *in litt.*, 2 December 1986). When disturbed, iguanas may dive from overhanging branches into the water, where they may swim submerged for considerable distances. They can defend themselves with biting and lashing of the tail when cornered (Hoogmoed, 1973).

THREATS TO SURVIVAL The main use of *I. iguana* since prehistoric times has been for food, both its flesh and its eggs being widely esteemed. Iguanas are also reputed to have medicinal values. In Mexico they are thought to be effective against renal disorders (Flores Villela, 1980), and aphrodisiac properties have been attributed to the eggs (Jacobs, 1984) and flesh (Fitch *et al.*, 1982). The eggs are usually preferred to the flesh, and indeed in some areas, such as northern Colombia, the flesh is not consumed at all. Where they occur sympatrically, the flesh of *Ctenosaura similis* (Fitch *et al.*, 1982) or *Iguana delicatissima* (Lazell, 1973) is usually preferred to that of *I. iguana*. In Mexico, *I. iguana* is usually preferred to *Ctenosaura* spp. (G. Ceballos, *in litt.*, 2 December 1986). As well as subsistence hunting, iguanas are often available in markets and restaurants throughout Central and South America. They are usually sold live, the legs being tied across the top of the back; the mouth may also be sewn shut, in which condition they can be kept alive for many days (Fitch *et al.*, 1982). In recent years a lucrative pet trade in live animals has grown up, and they may also be dried or stuffed and sold as curios. The skins are tanned for the speciality leather trade, and there is a small demand for iguanas as laboratory animals, for both anatomical and physiological studies (Lazell, 1973, Flores Villela, 1980).

The usual methods of hunting are by shooting with a small-calibre rifle or a sling-shot. Snaring is also used, and occasionally hunters have a noose on the end of a long pole to capture iguanas in trees. Dogs are often used to run

down iguanas flushed in the open, to locate iguanas in burrows or to retrieve wounded animals (Fitch *et al.*, 1982; Flores Villela, 1980). Eggs are sometimes dug from the nests but, in a common and misguided attempt at sustainable utilization, the eggs are often excised from living females which are later stuffed with ash or dead leaves, sewn up and released, in the belief that they will survive to breed again. In other cases the cosmetic surgery may be dispensed with (Harris, 1982; Flores Villela, 1980).

Belize Trade in *I. iguana* appears to have declined in Belize. In four weeks in 1971, 300 were sold in the market in Belize City; none were sold during a week of observation in 1976; and only about 24 were sold over a 3-week period in 1977. Only gravid females were observed on the last occasion, the eggs being more highly esteemed than the flesh. The majority of the *I. iguana* sold in Belize City in 1971 had been obtained in the Cayo District, near the Guatemalan Border, and further animals were noted in markets in Cayo and Stan Creek (Fitch *et al.*, 1982).

Brazil *I. iguana* is one of the species hunted frequently by the Coboclos living along the banks of the Amazon and its tributaries. It is much prized for its flesh and also hunted for its skin (Cunha, 1961). Several tribes of Indians, including the Caraja and the Waiwai, are known to have hunted iguanas regularly (Fitch *et al.*, 1982).

British Virgin Islands As far as is known, deliberate killing of iguanas is insignificant, the main threats coming from human disturbance of the habitat and exotic predators, including cats, dogs and mongooses (Budd, S.D., *In litt.*, 7 January 1986).

Colombia Over-exploitation of *I. iguana* in Colombia is giving concern. Eggs are the main product, and are usually sold boiled, when they fetch double the price of hens eggs. The meat is considered a low class food but Indians and other poor Colombians may depend heavily on it for protein (Harris, 1982). In the islands of Providencia and San Andrés the species is much persecuted for its meat and eggs. Live animals, captured in Providencia, are sold in the market in San Andrés (Gallego, 1978).

Costa Rica There is thought to be no commercial hunting in Costa Rica, but local hunting is heavy in some areas. In 1963, 40 gravid females were konwn to have been caught by locals along four miles of beach at Tortugero, on the north-east coast, and several nests were known to have been destroyed by dogs (Fitch *et al.*, 1982).

El Salvador Iguanas are absent from most of their former range in El Salvador but are still hunted in appreciable numbers in the area around San Miguel, although there they are thought to be mostly *Ctenosaura similis* rather than *I. iguana*. Even where they are scarce and commercial hunting is unprofitable, subsistence hunting-pressure is still intense owing to the scarcity of protein. Retail prices of *I. iguana* in markets in Santa Ana, San Miguel and Le Union in 1979 ranged from US$1.40 for animals without eggs to US$2.40 for females bearing eggs. Prices in the markets in San Salvador were up to US$5.20 each, representing a 3- to 8-fold increase since 1976. El Salvador is a major importer of iguanas, most carried illegally on foot across the borders from Honduras and Nicaragua. The small town of Santa Rosa de Lima, near the Honduran border is of central importance, hundreds of iguanas passing through the market for redistribution to other towns. In 1976, large numbers were being imported from Nicaragua by boat across the Gulf of Fonseca, but by 1979 there were few or none, as numbers had declined and export had been made illegal (Fitch *et al.*, 1982).

French West Indies On the Iles des Saintes the people are reported to slaughter iguanas in large numbers. Some are stuffed and sold as curios (Lazell, 1973).

Grenada Iguanas are considered a delicacy by the Grenadians, but the numbers hunted are not known (Ministry of Agriculture and Tourism, Grenada, *in litt.*, 15 November 1985).

Guatemala Over-hunting of iguanas has been reported in Guatemala (Flores Villela, 1980), and the numbers sold are reported to have declined with the falling population of wild animals. The reduction in the supply and the rising prices have apparently caused some consumers to abandon iguanas as a food source. Adult *I. iguana* were being sold in 1979 in the market at Mazatenango at US$3 each, and juveniles at US$1.50. Some are traded across the border to El Salvador (Fitch *et al.*, 1982).

Honduras Hunting and habitat destruction are thought to be a threat only in the Choluteca region where iguana populations may be only 10% of their former levels. In other more sparsely populated regions hunting pressure for home consumption is slight, and restricted transport prevents the ready export of iguanas, although illegal exports undoubtedly occur along the border to El Salvador. The price of *I. iguana* in the market in Tegucigalpa in 1979 was reported to be US$1.25-3. Unrestricted use of pesticides is suspected to have had a part in the reductions in some areas (Fitch *et al.*, 1982). *I. iguana* is considered a game species in Honduras (Fuller and Swift, 1984).

Mexico *I. iguana* is very popular as food in Mexico and is much preferred to *Ctenosaura* spp., particularly in Jalisco and Colima (G. Ceballos, *in litt.*, 2 December 1986). The main areas where iguanas are hunted are Chiapas, Veracruz, Michoacan, Oaxaca, Guerrero, Tehuantepec (Flores Villela, 1980), the Yucatan Peninsula (Fitch *et al.*, 1982) and Tabasco (Huerta and Mondragon, 1975). They are frequently found in markets in Guerrero (Flores Villela, 1980) and Tabasco, and are extensively hunted in Chiapas, where they are now much reduced in numbers. In some markets in southern Mexico vendors were reported to be selling small helpings of iguana stew at US$0.45 to US$1.35, the inflated price reflecting its supposed medicinal properties. There is substantial evidence that the aboriginal peoples of Mexico hunted iguanas (Fitch *et al.*, 1982). The main hunting season is in March-April when gravid females are selectively caught because their flavour is preferred. Occasionally the female is discarded after the eggs have been removed. Some iguanas are also killed for their skins; males are selected for this purpose because the skin needs to be larger than 30 x 40 cm (Huerta and Mondragon, 1975). The skin trade has flourished recently for the manufacture of belts and boots, the latter fetching up to US$100 a pair (G. Ceballos, *in litt.*, 2 December 1986).

Netherlands Antilles Iguanas are a popular food item in the Netherlands Antilles and a survey conducted on Curacao revealed that 60% of the population eat iguanas and 32% of the male population hunt iguanas, mainly for their own consumption. This is related to the fact that most people like their iguanas either live or recently dead, as the flesh deteriorates fast (Bakhuis, 1983). The price of iguanas was approximately AG10 (AG1 = US$0.56) in 1983 (Bakhuis, pers. comm.).

Nicaragua Large-scale exploitation has been reported to be threatening both species of iguana with extinction. In 1968 it was estimated that 150 000 were eaten annually within the country and there was reported to be a mass export to El Salvador, where they had already been depleted. Hunters in some areas were reported to have stopped hunting by 1976 as the animals were so scarce. Only in the sparsely populated, inaccessible areas was the hunting pressure

low. There was a well organised distribution system in 1976, with a group of professional hunters near the Honduran border supplying iguanas to the rest of the country. Other sources were in San Francisco de Carniceria, on Lago de Managua, and San Carlos, on Lago de Nicaragua. Dealers collect iguanas from the hunters in weekly rounds, and take them to the city markets. Prices were highest, and iguanas scarcest, in the South-east (Fitch *et al.*, 1982).

Panama In 1950 iguanas were reported to have been sold in large numbers in the market in Panama City, but very few were available by 1969. Sale of iguanas was made illegal in 1967, and the ban was apparently well enforced, but it was lifted again in 1979 because of a beef shortage (Fitch *et al.*, 1982).

Peru Over-hunting for skins and the pet trade is thought to have reduced iguana populations around Iquitos. A number of skins and a few live animals are exported from Iquitos each year. Iguanas are not though to be eaten in the region (Dixon and Soini, 1986).

Suriname *I. iguana* is not thought to be hunted in Suriname, but skins reported to have originated there have probably been smuggled over the border from Brazil (M.S. Hoogmoed, *in litt.* 26 August 1986).

Venezuela Hunting of iguanas is now illegal apart for sport hunting (Venezuela CITES MA, 1987), although they were formerly much prized by some indigenous peoples (Fitch *et al.*, 1982). Illegal hunting still occurs in the north of the country and the lizards are often sold along the road from Puerto La Cruz to Caracas and in Estado Sucre. Such sales are illegal and the meat is never seen in markets nor served in restaurants. There is less hunting in the south of the country, although females are often caught to extract their eggs, which are locally popular (S. Gorzula, *in litt.*, 11 April 1984). There are plans to develop a commercial management plan for this species (Venezuela CITES MA, 1987).

INTERNATIONAL TRADE Apart from the illegal trade in iguanas for food in Central America, mentioned in the previous section, the only other data on international trade are those contained in the Annual Reports of Parties to CITES. Virtually all the transactions recorded were in skins or live animals, and only these have been included in the following analysis. The CITES reports are summarised in Tables 1 and 2.

The tables show that the majority of the reported trade is in live animals, the chief importers being the USA and F.R. Germany (Table 1). This implies that they are used primarily as pets rather than food items. The trade reached a peak of over 109 000 in 1985. The major suppliers of live animals were Colombia, El Salvador, Suriname, Guatemala, Guyana and Mexico. Of these Colombia has exported few recently, while El Salvador, Guatemala and Guyana have increased their exports (Table 2). A pricelist, published by an animal supplier in the USA (South American Unlimited, New York) in 1985, gave the price of live Green Iguanas from Suriname as US$12 for 1 ft (30 cm) animals to US$35 for 3-4 ft ones.

Significant quantities of skins were traded in 1980 and 1981, but the volume has since declined sharply, and none was reported in 1984. The skins originated mostly in Colombia, and this may be associated with the fact that Colombia implemented a new plan to control the export of wildlife in 1978, under which only two companies were allowed to export their remaining stocks of hides. The skins appeared to follow a circuitous route, passing first through the USA then to the UK, from where they were re-exported mainly to F.R. Germany, Canada, Spain, Egypt and even back to the USA. The 16 633 skins

reported from unknown countries of origin in 1980 in Table 2 were mostly re-exported by the UK, and it is reasonable to assume that the bulk of these were skins from Colombia, of which the UK imported 20 000 in 1980. This suggests that the international trade routes are not well established and that there may be little regular trade in iguana skins. The only other major source of skins was Paraguay, which produced 5000 in 1982.

Of the countries with no wild populations of *I. iguana* from which exports were reported (Table 2), it seems likely that the majority of the exports were in reality re-exports, the country of origin not having been specified. Exceptions are probably Indonesia and Singapore, from which significant exports of skins were reported in 1980 and 1981; it is possible that the skins were wrongly identified, and that they may have been *Varanus* spp. Similarly the skins exported from Argentina may have been of *Tupinambis* spp. The export from Ghana may result from a confusion with Guyana, or refer to *Varanus* sp.

Table 1. Minimum net commercial imports of live *I. iguana* (L) and their skins (S) reported to CITES.

	1980	1981	1982	1983	1984	1985
Argentina	6 L	10 L	–	–	–	228 L
Austria	–	114 L	80 L	16 L	122 L	40 S
Belgium	–	–	–	–	–	101 L
Canada	4955 S	7185 S	–	1125 S	–	1 S
	404 L	442 L	113 L	929 L	1639 L	2624 L
China	4 L	–	–	–	–	–
Costa Rica	–	–	5 kg S	–	–	–
Denmark	24 L	16 L	15 L	86 L	527 L	292 L
Dominica	–	–	–	–	–	40 L
Egypt	3105 S	–	–	–	–	–
Finland	–	–	3 L	–	–	–
France	4 L	316 S	13 S	2 L	2 L	2 L
German D.R.	180 L	–	–	–	4 L	–
Germany, F.R.	9896 L	2489 L	1792 L	1552 L	6403 L	10900 L
Guyana	–	–	–	50 L	–	–
Israel	60 S	10 L	3 L	–	55 L	1 L
Italy	19 L	–	–	166 L	–	620 L
Japan	108 L	42 L	75 L	496 L	736 L	1022 L
Malaysia	2 L	–	–	–	–	–
Netherlands	2 L	102 L	589 L	362 L	481 L	559 L
New Zealand	–	–	–	–	–	6 L
Singapore	–	–	10 L	–	–	10 L
S. Africa	–	6 S	–	–	–	6 L
S. Korea	–	–	–	–	5 L	–
Spain	–	599 S	2 L	27 L	10 L	20 L
Sweden	–	–	–	–	6 L	4 L
Switzerland	–	23 S	–	–	–	750 S
	180 L	304 L	210 L	288 L	326 L	–
UK	3367 S	–	–	–	–	–
	498 L	922 L	337 L	988 L	1104 L	733 L
USA	10016 S	26485 S	5243 S	–	–	–
	51387 L	51562 L	37120 L	37750 L	34303 L	92450 L
TOTAL	21503 S	34614 S	5256 S +	1125 S	–	791 S
	62714 L	56013 L	40349 L	42712 L	45723 L	109786 L

Table 2 Reported countries of origin or export for commercial exports of live *I. iguana* (L) and their skins (S) reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries with wild populations of *I. iguana*						
Colombia	20500 S	8978 S	2 S	1125 S	–	750 S
	3301 L	34108 L	320 L	–	–	–
Costa Rica	–	–	121 S	–	–	–
Ecuador	–	–	–	–	–	222 L
El Salvador	54 L	8140 L	31146 L	23668 L	13737 L	24152 L
Fr. Guiana	–	6 L	630 L	50 L	–	–
Guatemala	61584 L	3781 L	25 L	4400 L	19850 L	72181 L
Guyana	56 L	41 L	839 L	3952 L	7591 L	7180 L
Honduras	75 L	85 L	120 S	–	–	222 L
Mexico	3 S	–	–	–	–	–
	76 L	10 L	3487 L	891 L	225 L	–
Neth. Antilles	–	–	–	43 L	–	–
Nicaragua	–	–	5 kg S	–	–	–
Panama	152 L	–	–	150 L	50 L	2 L
Paraguay	–	–	5000 S	–	–	–
Peru	–	20 L	100 L	330 L	285 L	820 L
Suriname	300 L	10212 L	5847 L	9047 L	3960 L	4605 L
Venezuela	–	–	–	–	10 L	–
Countries without wild populations of *I. iguana*						
Argentina	1000 S	5294 S	–	–	–	–
	–	14838 L	–	–	–	–
Australia	–	–	–	–	–	52 L
Chile	–	–	–	–	80 L	–
Germany, F.R.	–	–	11 L	–	–	–
Ghana	14 L	–	–	–	–	–
Guinea	–	–	–	–	20 L	–
Haiti	–	23 L	–	–	–	–
Indonesia	1959 S	1000 S	–	–	–	–
Netherlands	10 L	–	–	–	–	–
Singapore	1950 S	1875 S	–	–	–	–
Tanzania	–	–	–	–	–	350 L
USA *	1 L	1 L	12 L	283 L	74 L	274 L
Uruguay	–	–	–	15 L	–	–
Unknown	16633 S	9056 S	13 S	–	–	41 S
	38 L	6988 L	45 L	31 L	70 L	2 L

* It is not clear whether the US report includes Puerto Rico or the US Virgin Islands, in which *I. iguana* does occur.

CONSERVATION MEASURES The legislation controlling the hunting, trade and export of *I. iguana* is summarised in Table 3. Owing to the wide distribution of this species it can be found in the majority of National Parks within its range. In these it will generally receive greater protection than in the rest of the country.

There has been one attempt at the re-introduction of *I. iguana* to a National Park in Panama (see Captive Breeding Section).

Table 3. Legal prohibition on the hunting, internal trade and commercial export of *I. iguana*. Dates are those on which the legislation came into force. A - All live animals & parts; L - Live animals only; S - Skins; P - Allowed under permit; C - Closed seasons may be imposed; * - these territories are Overseas Départements of France with which the EEC may trade without the imposition of CITES controls; ? - no information (mostly from Fuller *et al.*, 1987).

	CITES	Hunting	Trade	Export
Aruba	-	-	?	?
Belize	1981	-	A 1981	A 1981
Bolivia	1979	-	S 1979	A 1985
Brazil	1975	-	A 1967	A 1967
Br. Virgin Is	1976	?	?	P
Colombia	1981	P	-	L 1978
Costa Rica	1975	A 1985	A 1970	A 1970
Dominica	-	?	?	?
Ecuador	1975	-	-	A 1983
El Salvador	1987	-	-	-
Fr. Guiana	1978 *	-	-	P
Fr. W. Indies	1978 *	-	-	P
Grenada	-	-	-	-
Guatemala	1980	-	-	P
Guyana	1977	-	-	A 1986 +
Honduras	1985	C	P	P
Mexico	-	C	-	A 1982
Neth. Antilles	-	-	?	?
Nicaragua	1977	C	P	P
Panama	1978	A 1980	A 1980	A 1980
Paraguay	1977	A 1975	A 1975	A 1975
Peru	1975	C	A 1973	A 1973
St Lucia	1983	A 1980	A 1980	A 1980
St Vincent	-	?	?	?
Suriname	1981	C	-	P
Trinidad & Tobago	1984	?	?	P
US Virgin Is	1975	?	?	P
Venezuela	1978	C	A 1970	A 1970

\+ Export quotas of 8400 live *I. iguana* were suggested for 1987 and 1988.

CAPTIVE BREEDING Because of their widespread use as a food item, their relatively high fecundity and their herbivorous habit, *I. iguana* has been suggested as a suitable candidate for commercial captive breeding. Experimental projects have been initiated in at least two countries.

In Curacao at the Government research institute of Carmabi, Pescadera Bay, iguanas were initially kept in small cages measuring 2 x 3 x 5 m. Later an open enclosure of 10 x 10 m was constructed into which over 50 iguanas were introduced. Shelters comprising tiers of wooden drawers, each having an entrance hole small enough to exclude cats, were used by the animals at night. They were fed on leaves and fruits and a breeding success of 100% was reported. Further trials were under way to see whether they could be reared economically (Bakhuis, 1983).

Iguana iguana

The Smithsonian Tropical Research Institute in the Republic of Panama started an Iguana Management Project in 1983 under Dr Dagmar Werner, in collaboration with the Directorate of Renewable Natural Resources, the Institute for Agricultural Research and the University of Panama. The project aims to repopulate areas which have been depleted of iguanas, using captive-raised stock. Artificial incubation is claimed to raise survival to one year from 5% to 95% (Werner, 1986). Initially 400 wild-caught hatchlings were divided into groups of 10 to 20 and introduced into small, fenced enclosures, measuring about 12 square yards (10 m^2) containing bamboo shelters, and were fed on fruit and natural vegetation. Later it was found that up to 60 iguanas could be kept in each enclosure. In breeding trials adult females were captured from the wild and induced to lay eggs in containers buried in artificial clearings (Werner and Miller, 1984). Eggs were collected and incubated artificially to produce over 700 hatchlings. Some of the hatchlings were used to carry out a small repopulation experiment in central Panama in 1984 (Jacobs, 1984). A further 1200 were released in December 1985 around farms, and the initial survival appeared to be high. The possibility of reforesting areas with fodder trees in an attempt to regenerate natural habitat has been suggested (Werner, 1986).

Iguanas are regularly kept as pets in several countries, and may breed in captivity. CITES Annual Reports contain records of 6 captive-bred specimens in 1982 and 2 in 1983. It is apparent that the pet trade in *I. iguana* depends almost entirely on wild-caught animals.

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CAIMAN LIZARD

Recommended list: 2
[Possible problem]

Dracaena guianensis Daudin, 1802

Order SAURIA

Family TEIIDAE

SUMMARY AND CONCLUSIONS A large and little-known semi-aquatic lizard, found throughout much of the Amazon basin. There are conflicting reports of its distribution, but the only reliable records are from Brazil, Ecuador and Peru; it does not occur in the Guianas. A closely related species, *Dracaena paraguayensis*, occurs in the Matto Grosso of Brazil, Paraguay and Bolivia. *D. guianensis* grows to about 1.2 m, and has large, blunt teeth, adapted to crushing snail shells, which form its diet almost exclusively.

It is hunted chiefly for its skin, up to 90 000 of which appear to be traded annually. The main importing countries are the USA and Japan, and the main reported countries of origin are Paraguay, and the Guianas.

Nothing is known about the population size, and so it is impossible to say whether this level of exploitation is excessive. However almost all of the reported trade in *D. guianensis* is from countries which have no wild populations of the species, and a large proportion is from Paraguay, which has a ban on wildlife exports. The trade should therefore virtually cease were CITES controls to be implemented correctly by the importing countries. Many of the skins traded may be from the Pantanal and therefore of *D. paraguayensis*. Consideration should therefore be given to listing the two taxa as "*Dracaena* spp." on Appendix II.

DISTRIBUTION Found chiefly within the Amazonian drainage basin, where it is widespread.

Brazil Occurs throughout the Amazonian region from Belem (Duellman, 1987) at least as far as Tefé (W.E. Magnusson, pers. comm., 1986), but is absent from the Atlantic forests (Dixon, 1979). Amaral (1950) indicates that it occurs up the Tocatins River to the Sao Francisco Basin, and that it is particularly abundant in the tidal, marshy sections of the Amazon.

French Guiana the type locality of *D. guianensis* is Cayenne, French Guiana, and most subsequent discussions of the distribution of the species have included the country on the basis of this information. However Hoogmoed and Lescure (1975) showed that there were no other records from the country, and consider that the type locality is erroneous, representing the port of export rather than the true origin of the type specimen. They conclude that *D. guianensis* does not occur in French Guiana.

Guyana Hoogmoed (1973) indicates that this species is absent from the western part of the Guianan region (Suriname and Guyana), although Crawford (1931) lists it in his key to the herpetofauna of the country, which includes species for which "there seems to be an authentic record of collection within the colony". No record has been located.

Ecuador Duellman (1987) recorded the species from Santa Cecilia and it was included, without comment, in a checklist of the reptiles of Ecuador (Miyata, 1982).

Paraguay There are records of three museum specimens of *D. guianensis* from the Matto Grosso region (Peraccia, 1902; Burt and Burt, 1931), but Vanzolini and Valencia (1965) identified these as the subsequently described

and closely related species *Dracaena paraguayensis* Amaral 1950. Therefore *D. guianensis* has not been recorded from Paraguay, and it is unlikely that it occurs there, as it is outside the Amazon drainage basin.

Peru Recorded from Cashiboya in the Amazonian region (Boulenger, 1885; Hoogmoed, 1979) and Cuzco Amazonica Reserve on the Madre de Dios River (Duellman, 1987). In the Iquitos Region, Dixon and Soini (1986) obtained specimens from Centro Union, Moropon and Iquitos.

Suriname There have been suggestions that this species may occur in Suriname, but Hoogmoed (1973) refutes them, indicating that it is absent from the western part of the Guianan region (Suriname and Guyana).

Groombridge (1983) states that the species possibly occurs in other countries bordering the Amazon, but Hoogmoed (1979) indicates that there are as yet no records from the Amazonian regions of Colombia and Bolivia, nor are there any from Venezuela (S. Gorzula, *in litt.*, 11 April 1986).

POPULATION There is no information available on the size of the population of *D. guianensis*. The paucity of knowledge of the species may indicate that it is scarce, but it could equally reflect its inconspicuous nature and tendency to inhabit swamps and the smaller waterways, which are seldom visited. Duellman (1987) conducted a study of lizards at Cuzco Amozonico Reserve, Peru, and captured only one *D. guianensis*, but because of its size it accounted for 15.5% of the lizard biomass. Dixon and Soini (1986) reported that during the flood season these lizards were occasionally seen swimming in the flooded streets of towns and villages in the Iquitos region.

HABITAT AND ECOLOGY A large, semi-aquatic lizard inhabiting river margins and areas of flooded forest, *D. guianensis* has seldom been studied in the wild, and little is known of its ecology. It is particularly characteristic of the tidal, marshy areas around the mouth of the Amazon. Fully grown it reaches a length of 4 feet (1.2 m) and is sometimes mistaken for a caiman, having powerful jaws (Breen, 1974), although the teeth are blunt and rounded, adapted for crushing snail shells (Darymple, 1979; Preghill, 1984). One of its local names is Jacuaruxi, and it is regarded as a species of caiman by the fishermen around Tefe (W.E. Magnusson, pers. comm.). The lizard preys almost exclusively on snails, which it catches by foraging in the water. Rand (1964) reports that it hunts underwater, walking along the bottom, and searching under the leaves, while Vanzolini (1961) observed it feeding walking on its hind legs, with its head above the water. The snails are usually brought to the surface and crushed; the fragments of shell are not found in the faeces and are expelled from the mouth before the snail is eaten (Dixon and Soini, 1986; Vanzolini, 1961).

When not feeding, it usually lies along the branches of trees and bushes, relying on cryptic colouration to avoid detection (Vanzolini, 1961). The back is olive brown and the belly is yellowish with black marbling (Cunha, 1961). Young animals are reported to have green bodies and reddish brown heads (Dixon and Soini, 1986). It swims well, with strong strokes of the flattened tail, and may take refuge in holes underwater when disturbed. The habit of resting in trees may enable it to avoid aquatic predators, chief amongst which are probably caimans (Vanzolini, 1961).

Very little is known of the breeding biology of this species. There are two records of females both having 17 yolked ovarian follicles, and a single report of a nest lodged in a termite mound (Best, 1984; Dixon and Soini, 1986).

THREATS TO SURVIVAL There is very little information regarding exploitation of this species, although Cunha (1961) reports that it is much persecuted in Amazonia for its flesh and principally its skin. Dixon and Soini (1986) reported that a number of skins and a few live individuals are shipped out of Iquitos each year. Hoogmoed (*in litt.*, 26 August 1986) considered that the skins of this species reportedly originating in Suriname had almost certainly been smuggled in from Brazil. In common with other Amazonian species, its habitat is threatened by deforestation and the extensive hydro-electric dam projects now under consideration.

INTERNATIONAL TRADE The only reports of international trade in *D. guianensis* are those contained in the Annual Reports of Parties to CITES. Since 1980, there have been no reports of trade in live animals, the bulk being of trade in skins; the great majority of these were reported as numbers of skins, with insignificant quantities being reported by weight or length. These last two categories were therefore excluded from the following analysis. The CITES reports are summarised in Tables 1 and 2.
Table 1 shows that the minimum world trade volume of *D. guianensis* skins varied from 8925 to 85 335 skins between 1980 and 1985. The chief importers were Japan and the USA. In 1981 and 1984 Japan was a net exporter, although its gross imports were over 10 000 skins. Most of the skins eventually destined for the USA in 1984 went via Japan, suggesting that they were probably tanned there. Other major importers are Belgium, Italy and Spain. To judge by reported countries of export or origin (Table 2), France must also have imported appreciable quantities of skins, although until 1984 it did not report imports of Appendix II species.

Table 1. Minimum net imports of skins of *D. guianensis* reported to CITES, excluding transactions reported by weight or length.

	1980	1981	1982	1983	1984	1985
Argentina	-	160	-	-	-	-
Belgium	-	-	-	9117	-	-
Canada	-	-	2	-	-	-
France	-	-	-	-	4636	-
Italy	-	200	6163	886	-	-
Hong Kong	-	-	-	-	188	-
Japan	5000	-	40300	8655	-	1695
Korea	-	-	-	120	116	-
Mexico	-	1000	-	-	-	-
Spain	-	-	-	2307	-	-
Switzerland	180	-	-	-	8	-
USA	3745	71062	38870	16631	43499	23506
Total	8925	72422	85335	37716	48447	25201

The distribution of *D. guianensis* is incompletely known, however Table 2 shows that the only country known to have a wild population which is reported as a country of origin is Brazil. Venezuela may also have some *D. guianensis* in the extreme south, and it was given as the country of origin of 100 skins in 1981. Both Brazil and Venezuela have bans on the hunting of this species (see Table 3).

Of the source countries not having wild populations of *D. guianensis*, the exports from France, Japan and Spain probably indicate re-exports where the country of origin was not specified. The skins from Indonesia could fall into this category or they could represent incorrect identification. But the remaining countries, Argentina, Paraguay, French Guiana, Guyana and Suriname, all border on Brazil. It is known that large quantities of *Caiman* skins are smuggled into Paraguay out of Brazil, where their hunting is prohibited, and are then exported to consumer countries. It appears that the same is also happening with *D. guianensis*, both into Paraguay and also Guyana and Suriname. The possibility of confusion of the skins with the similar species *Dracaena paraguayensis* is discussed below. The whole of the world trade in this species therefore appears to involve illegally acquired skins, the vast majority having been smuggled to Paraguay, French Guiana, Suriname and Guyana.

Table 2. Reported countries of origin and quantities of transactions in whole skins of *D. guianensis* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries known to have wild populations of *D. guianensis*						
Brazil	-	67	-	-	-	-
Countries without wild populations of *D. guianensis*						
Argentina	1092	5000	3000	-	-	-
France	90	4966	5000	-	-	-
Fr. Guiana	5180	8417	8909	1104	-	-
Guyana	-	10141	22680	6715	786	7935
Indonesia	-	-	-	1000	1520	-
Japan	-	-	-	-	2000	-
Mexico	-	-	-	-	2	-
Paraguay	-	28205	47096	34665	31386	18428
Spain	962	-	-	-	-	-
Suriname	6490	26339	6653	2913	2538	-
Venezuela	-	100	-	-	-	-
Unknown	1253	2893	3992	877	16274	1181

CONSERVATION MEASURES The protection status of *D. guianensis* in the countries surrounding its range is given in Table 3. With a few marginal exceptions, the great bulk of the population of *D. guianensis* lives within Brazil, a country in which it is totally protected. In spite of this, large-scale poaching is clearly taking place. The Brazilian Government is fully aware of this problem and has initiated measures using troops to combat the poaching and smuggling in the Pantanal region in the South of the country, where many wildlife products are known to be smuggled out to Bolivia and Paraguay. The scale of the problem is such that these measures have not yet had any detectable effect in significantly curtailing the trade. Table 2 indicates that the northern border of Brazil is equally permeable to illegal wildlife trade, but, so far as is known, no concerted effort has been made to prevent this from the Brazilian side. Earlier confusion over the distribution of *D. guianensis* led to the belief that it occurred in French Guiana, Guyana and Suriname. It is possible that this mis-apprehension has been exploited by traders, who have discovered that these countries are acceptable countries of origin when applying for import permits. This loophole could be closed if the

distribution of the species were specified unequivocally to the CITES Management Authorities. Measures have been initiated by CITES to ensure that Suriname is not accepted by importing countries as a possible country of origin, after the Secretariat was informed by the Suriname Management Authority that the species did not occur in the country. The same procedure could be followed with the other two countries.

D. guianensis does not occur in Paraguay, and, in any event, all wildlife exports from the country are prohibited. Nevertheless all the major importing countries, notably the USA and Japan, have accepted imports of Paraguayan skins, apparently without question. The closely related species, *Dracaena paraguayensis*, lives in the Pantanal region of Paraguay and southern Brazil, and looks very similar to *D. guianensis*. Vanzolini and Valencia (1965) remark that "while there is no actual evidence indicating that the two forms are races of a same species, the possibility cannot at present be ruled out." It is thought that a large proportion of the illegal trade in *Dracaena* may originate in the Pantanal, and therefore be in *D. paraguayensis*. There is no information on the status of this species, but it is at least more accessible than *D. guianensis* (W.E. Magnusson, pers. comm.). The scarcity of records for *D. paraguayensis* (Vanzolini and Valencia, 1965) indicates that its population density may be similar to that of *D. guianensis*. Consideration should therefore be given to including the whole genus in CITES Appendix II, a step which is, in any event, justified on the grounds that the two species look very similar (Amaral, 1950).

Table 3. Legal prohibition on the hunting, internal trade and commercial export of *D. guianensis*. Dates are those on which the legislation came into force. A - All live animals & parts; L - Live animals only; S - Skins; P - Allowed under permit; C - Closed seasons may be imposed; * - these territories are Overseas Départements of France with which the EEC may trade without the imposition of CITES controls (Fuller *et al.*, 1985).

	CITES	Hunting	Trade	Export
Bolivia	1979	-	S 1979	A 1985
Brazil	1975	A 1986	A 1967	A 1967
Colombia	1981	P	-	L 1978
Ecuador	1975	-	-	A 1981
Fr. Guiana	1978 *	-	-	P
Guyana	1977	-	-	A 1986
Peru	1975	A 1973	A 1973	A 1973
Suriname	1981	-	-	P
Venezuela	1978	C	A 1970	A 1970

CAPTIVE BREEDING No records have been found of *D. guianensis* having bred in captivity, and only one animal was listed in an international survey of 260 zoological collections in 1985 (Slavens, 1985).

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TEGU LIZARDS

Recommended list: 1 [Problem]

Tupinambis spp.

Order SAURIA

Family TEIIDAE

SUMMARY AND CONCLUSIONS A genus of large lizards, growing to about 1.3 m, very widely distributed in South America, from Darien to northern Patagonia. The taxonomy is confused, but there are probably two or three species, the cured skins of which are virtually indistinguishable. They inhabit many different habitats, from tropical forests to arid scrub, and are generally hardy and opportunistic. They are diurnal, retiring to burrows at night, and are omnivorous, eating mainly invertebrates, small vertebrates, fruits and, when adult, carrion. In the South of the range, hibernation occurs from about March to September in burrows or rock crevices. Broods of about 20-35 eggs are laid in burrows, and usually hatch in late December to January.

They are very extensively hunted for skins, but also locally for meat. Argentina and Paraguay are the main exporters, the former exporting about a million skins annually, mostly to the USA and Western Europe. There is an insignificant trade in live animals. Argentinian law sets closed seasons and quotas for hunting on a provincial basis, but these are not based on a knowledge of population size or biology, and the numbers of *Tupinambis* are slowly declining.

The genus is described as common or abundant throughout some of its wide range, and can undoubtedly withstand a substantial level of trade. There is currently a large illegal trade in skins from Paraguay which could be halted if CITES controls were implemented by the importing countries. The bulk of the skins are legally exported from Argentina under a management scheme, but this appears to be inadequate at present. A project currently in progress aims to assess the population status and revise hunting quotas and seasons in the country. The taxonomy of the genus is in urgent need of revision.

DISTRIBUTION There is considerable confusion over the taxonomy and distribution of the genus *Tupinambis*. Peters and Donoso-Barros (1970) recognise four species: *Tupinambis duseni*, from a single record in Parana; *Tupinambis nigropunctatus*, from the Amazon basin; *Tupinambis rufescens*, from western Argentina; and *Tupinambis teguixin*, from northern Argentina, Uruguay, Brazil and the Guianas. However the species occurring in the Guianas is normally considered to be *T. nigropunctatus* by most authors (e.g. Hoogmoed and Lescure, 1975). Presch (1973) attempted a review of the genus in which he suggested that *T. nigropunctatus* was included in *T. teguixin*, *T. duseni* in *T. rufescens*, and that the species distributed throughout the arid eastern and south-eastern regions of Brazil and Uruguay, was *T. rufescens* and not *T. teguixin*, as had been previously held. Hoogmoed and Lescure (1975) questioned his treatment of *T. nigropunctatus*, asserting that it was distinct, and should at least be considered a subspecies of *T. teguixin*. Presch's treatment of the species occurring in southern and eastern Brazil and Uruguay has received strong opposition from Vanzolini (1976), Gudynas (1981), and Donadio and Gallardo (1984), who concur with Achaval and Langguth (1972) in regarding the species as *T. teguixin*, though there is some suggestion that *T. rufescens* may also occur in Brazil (Vanzolini, 1976). As regards the implementation of CITES controls, there seems little point in differentiating beyond the level of the genus, as the skins are not readily distinguishable when cured.

The taxonomic status of *T. 'nigropunctatus'* poses few problems, as its distribution does not overlap with *T. 'teguixin'*, and it can either be

regarded as a full species (e.g. Hoogmoed, 1973), or as a subspecies of *T. teguixin* (e.g. Mertens, 1972). In Argentina the status of *T. rufescens* is not in dispute, but in southern Brazil, Uruguay, Paraguay and perhaps Bolivia, more work is needed to resolve the distinction between this species and *T. teguixin*. In the outline of the distribution, the following three taxa have been used:

Tupinambis 'nigropunctatus' (Spix): Widespread in northern South America, north of about 15°S, mainly to the east of the Andes, but reaching the Isthmus of Darien in Colombia.

Tupinambis 'teguixin' (sensu Boulenger): Widespread from eastern Argentina through Uruguay, Paraguay and Bolivia to Brazil, south of about 15°S.

Tupinambis 'rufescens' (Linnaeus): Mainly in the drier areas of western Argentina, but possibly extending through Paraguay into Brazil and perhaps Bolivia.

Argentina Two species occur in Argentina. *T. 'teguixin'* is found in the damper, eastern regions from Missiones, Corrientes, Entre Rios, Formosa, Chaco, Santa Fe, Santiago del Estero, Cordoba (especially the east), Buenos Aires and the east of La Pampa (Donadio and Gallardo, 1984). *T. 'rufescens'* is widespread in the drier areas in the west of the country, especially Sanitago del Estero, south of Jujuy, east of Salta, north-east and south-east of Tucuman, La Rioja, San Juan, Mendoza, with unconfirmed reports from the north-east of Neuquen, central La Pampa, south of San Luis, and possibly the north-west of Chaco (Donadio and Gallardo, 1984) and western Formosa (G. Hemley, *in litt.*, 25 March 1986). The most southerly record of this species is from Gran Bajo de Gualicho, south of the Rio Negro (Cei and Scolaro, 1982).

Bolivia Presch (1973) recorded one species, "*T. teguixin*", from the Rio Iténez and the Rio Mamoré, but Hoogmoed and Lescure (1975) suggested that the species occurring in South America, north of 15°S was *T. 'nigropunctatus'*. This would include the northern part of Bolivia, although in the southern part *T. 'teguixin'* would certainly occur, and the range of *T. 'rufescens'* may also extend into the country. Clearly, detailed studies are necessary.

Brazil The genus occurs thoroughout the country, from Amazonia to the arid regions in the east. Presch (1973) considered the species in the latter region to be "*T. rufescens*", although its earlier description as "*T. teguixin*" is probably correct (Vanzolini, 1976). Within the Amazonian drainage and the Pantanal, the species occurring to the north of about 15°S is considered to be *T. 'nigropunctatus'*, and to the south, *T. 'teguixin'* (Hoogmoed and Lescure, 1975). Presch (1973) considers both of these to be "*T. teguixin*". Vanzolini (1976) indicates that two species of *Tupinambis*, *T. 'teguixin'* and *T. 'rufescens'*, occur sympatrically in the cerrado vegetation region of Brazil. This implies that three species occur in the country. The description of *Tupinambis duseni* Lönnberg and Anderson, 1910 is not generally accepted.

Colombia *T. 'nigropunctatus'* is widespread, from the Amazonian region (Hoogmoed, 1979), through Meta, Magdalena, Bolivar and Antioquia to the Isthmus of Darien (Presch, 1973).

Ecuador Duellman (1987) recorded "*T. teguixin*" from Santa Cecilia in the Amazonian region of Ecuador, and Miyata (1982) included "*T. teguixin*" in a checklist of the herpetofauna of the country, but it is not clear what taxonomy they were following. It is likely to be *T. 'nigropunctatus'* and not *T. 'teguixin'* that occurs there.

French Guiana *T. 'nigropunctatus'* occurs in French Guiana, and is probably present throughout the country (Hoogmoed and Lescure, 1975).

Guyana Both "*T. teguixin*" and "*T. nigropunctatus*" are included in Crawford's (1931) checklist for British Guiana, although it is likely that only one form occurs there, and that this should be *T. 'nigropunctatus'* (Hoogmoed, 1973; Hoogmoed and Lescure, 1975). Presch (1973) lists several records from the Demerara district.

Paraguay Two species of *Tupinambis* have been recorded from Paraguay (Hellmich, 1960, *fide* Presch, 1973), probably corresponding to *T. 'teguixin'* and *T. 'rufescens'*. The genus is widespread, recorded from the Departments of Chaco, Central, Concepcion, Caaguazu and Alto-Parana (Presch, 1973).

Peru Present in the Amazonian region (Hoogmoed, 1979), and recorded from an altitude of 550 m at Rio Comberciato, near the great head of Urubamba (Presch, 1973). Dixon and Soini (1986) reported that *T. teguixin* occurred in all habitats in the Iquitos Region except in direct contact with human habitation. Duellman (1987) recorded *T. teguixin* from Cuzco Amazonico Ecological Reserve on the Madre de Dios River. If Hoogmoed and Lescure's (1975) suggestion that the species occurring in South America, north of 15°S is *T. 'nigropunctatus'* is correct, then this is the only form to occur in Peru. *Tupinambis* spp. are said to have been observed at Iquitos, Iparia, Rio Pachitea, Pucallpa, Sarayucu, and Satipo, though the claim that both *T. teguixin* and *T. rufescens* occur (Anon., 1985) is clearly erroneous.

Suriname *T. 'nigropunctatus'* occurs throught the country (Hoogmoed, 1973; *in litt.*, 26 August 1987).

Trinidad and Tobago *T. 'nigropunctatus'* is present on both islands (Hardy, 1982). Presch (1973) has records from Milford Bay, Tobago, and Princetown, Trinidad.

Uruguay Widespread, from the sandy coastal environments, inland at least to Tacuarembo (Achaval and Langguth, 1972; Gudynas, 1981). These authors consider the species to be "*T. teguixin*", while Presch (1973) refers it to "*T. rufescens*".

Venezuela *T. 'nigropunctatus'* is widespread throughout the country, including the llanos region (Rivero-Blanco and Dixon, 1979) and also Amazonia (Hoogmoed, 1979).

POPULATION

Argentina Said to be common in the east of Buenos Aires (Bella Vista, Campo de Mayo, San Miguel, Lujan, Jauregui, Lobos, Loma Verde, Otamendi, Zelaya, Rojas, and in the delta of the Parana), frequent in Cordoba (Laguna del Monte, Sampacho, Emblase Rio III, Dique la Vina, La Paz and Bialet-Massé), San Luis, Santa Fe, Entre Rios, Misiones, but not frequent in D'Orbigny (Gallardo, 1977). The largest populations of *Tupinambis* occur in Formosa and the western "impenetrable" zone of the Chaco province. Populations are slowly declining in Salta and Santiago del Estero. Local extinctions near towns have been noted in these two provinces as well as Formosa and Chaco (Hemley, G. *in litt.*, 7 March 1986).

Bolivia No information.

Brazil Said to be very common in Amazonia (Cunha, 1961), and one of the most abundant lizards in southern Brazil (Milstead, 1961). *T. teguixin* was

Tupinambis spp.

reported to be seen frequently in the Parque Nacional da Tijuca, Rio de Janeiro (Anon., 1981a).

Colombia No information.

Ecuador No information.

French Guiana No information.

Guyana No information.

Paraguay Populations of *Tupinambis* were said to have declined in most inhabited areas. Hunters reported having to walk further to find lizards and the scarcity can be attributed to overhunting. In some regions, where forests have recently been cleared, tegu populations are reported to have increased, but this may be due to the increased ease of observation (Norman, 1987).. *T. rufescens* was abundant in the Parque Nacional Defensores del Chaco (Torres Santibanez, 1978). *T. teguixin* is "seen frequently" in Parque Nacional Ybycui (Anon., 1982).

Peru Dixon and Soini (1986) reported that *T. teguixin* was observed on numerous occasions in the Iquitos Region and was more numerous than their small sample (5 animals) indicated. Duellman (1987) captured two *T. teguixin* in a survey of Cuzco Amazonico Ecological Reserve on the Madre de Dios River and concluded that it accounted for 22% of the lizard biomass.

Suriname Said to be common throughout but nowhere abundant (M.S. Hoogmoed, *in litt.*, 26 August 1987).

Trinidad and Tobago No information.

Uruguay Although still locally abundant, populations are said to have decreased as a result of human exploitation (Gudynas, 1981).

Venezuela No information.

HABITAT AND ECOLOGY The large teiid lizards of the genus *Tupinambis* are found in a wide variety of habitat types from dense tropical forest and marshes to arid scrubland. They are very opportunistic and hardy, and may do well in cattle farming areas. *T. rufescens* is particularly associated with arid areas, but even this species preferentially selects the margins of rivers and ponds (Donadio and Gallardo, 1984).

In the south of the range, at least, *Tupinambis* hibernates in burrows over the winter. In Argentina, the hibernation period is usually from March to May until August to October, but this varies depending on climatic conditions. Further North the hibernation period shortens, as temperatures increase; and *T. nigropunctatus* is active all year round in Venezuela. Burrows may be excavated to a depth of 0.5-1.5 m, or old vizcacha burrows may be taken over. Other favoured sites are crevices in rocky areas, hollow tree trunks and gaps under roots. During the summer they are diurnal, returning to burrows at night an emerging in the morning and basking before starting foraging (Millstead, 1961; Gudynas, 1981; Donadio and Gallardo, 1984).

Tupinambis is omnivorous, eating a variety of snails, slugs, myriapods, insects, and occasionally small reptiles, mammals and birds. Fruits and honey are also consumed, the lizards climbing trees to raid wasp and bee nests. Predation on the eggs of caimans, turtles, wild and domestic fowl is also reported (Palermo, 1983). Juveniles eat mostly insects, and as adulthood approaches there is an increasing trend towards carrion eating (Gudynas, 1981;

Donadio and Gallardo, 1984). This ontogenetic shift in diet is reflected in a corresponding change in the dentition (Presch, 1974). Juvenile *Tupinambis* are preyed upon by snakes and birds of prey. The adults have few natural predators except man and some larger cats. When cornered they may become aggressive, with displays of mouth-opening, hissing and tail-lashing. A more usual response to disturbance is to flee down the burrow (Donadio and Gallardo, 1984).

Courtship occurs in Argentina in October and November. The males emerge from their hibernation burrows first, and pursue the females when they appear. Mating usually takes place in mid-November, after which the female retires to a breeding burrow. This is usually 0.5 m deep and 1.5 m long, and the nest chamber is furnished with a layer of dry vegetation into which the eggs are laid. Some reports suggest that the female stays with the eggs until they hatch, usually from late December to early January. The clutch size varies from 20 to 54. In Pernambuco smaller clutch sizes of around 13-29 are reported. Egg dimensions are about 41-48 mm by 30-34 mm. Nests of *T. nigropunctatus* are reported to be often associated with arboreal termite nests (Donadio and Gallardo, 1984). There is some evidence that a second brood may be laid towards they end of the summer (Gallardo, 1977). The lizards in Argentina hatch at a length of 19-20 cm and grow to about 35 cm in their first five months. Adult *T. teguixin* are normally 1-1.35 m (3.5-4.0 kg), and slightly smaller for *T. rufescens*. The tail comprises about half of the total length (Donadio and Gallardo, 1984). Cunha (1961) reports a maximum size of 75 cm for his collection of *T. nigropunctatus*. Males are generally larger and more robust than females (Palermo, 1983).

THREATS TO SURVIVAL *Tupinambis* species are probably the most extensively hunted reptiles in South America. Some are hunted for food and for the pet trade, the fat is thought to have medicinal properties, but it is exploitation for skins that provides the biggest commercial incentive. The levels of trade are so great that they inevitably pose a potential threat to population levels, although there are few data to suggest that populations are declining at alarming rates. An Italian reptile leather dealer reported that the market was very depressed in 1985. The usual size of Tupinambis skins in trade is 17-30 cm belly width (Bodiopelli, *in litt.*, 4 March 1986). There is a minor trade in live animals for pets. A supplier in the USA (South American Unlimited, New York) listed "Golden Tegues" (*T. nigropunctatus*) on its price list in 1985 for US$15-20 each, depending on size. Habitat modification is also encroaching on the range of the species, but they are opportunistic animals, and may be able to establish themselves in cattle grazing areas, where they can capitalise on the abundant insect life associated with this type of farming, although population declines are still reported (G. Hemley, *in litt.*, 7 March 1986). Intensive arable farming and the use of pesticides would obviously pose a far greater threat.

Argentina Both species are hunted heavily for skins and meat. The consumption of meat varies from region to region; in some areas it is much sought-after, while in others it is totally rejected. The fat is supposed to cure a variety of ailments, including piles, sprains and infections, and is used to make poultices and as a laxative. It is frequently sold in markets in Santiago del Estero. Several hunting methods are used, the most common being with dogs, snares and digging out burrows. Trained dogs, particularly near Santiago del Estero, are used to locate the lizards or chase them into burrows. The skin is removed after making an incision along the back, and is then stretched out to dry. The importance of hunting varies from being the sole source of income in a few cases, to serving merely as a useful supplement (Donadio and Gallardo, 1984). The average value of skins exported between 1976 and 1979 was US$4.64 (Mares and Ojeda, 1984). In 1986 the value of skins in crust was reported to be about US$5-6 each. Previously most of the skins were

transported to tanneries in Buenos Aires or Santiago del Estero but recently a number of tanneries have opened in the North of the country. This has made the exploitation still easier. Habitat alteration is also contributing to the population decline, particularly the removal of the forest and thicket vegetation to make way for cattle grazing. The western Chaco region (Salta and Santiago del Estero) is badly affected, and some 80-90% of the habitat has been altered for grazing and farming (G. Hemley, *in litt.*, 7 March 1986).

Bolivia Large numbers of skins, possibly up to 300 000 a year, are believed to be illegally exported to Argentina (G. Hemley, *in litt.*, 25 March 1986).

Brazil *Tupinambis* is frequently hunted for its flesh and skin in Amazonia (Cunha, 1961), and also in Bahia, where it is thought to have a good flavour (Anon., 1981b).

Colombia No information.

Ecuador No information.

French Guiana No information.

Guyana No information.

Paraguay Tegus are widely hunted by farmers for skin and meat and for protection of their poultry. The meat is usually eaten by the hunter and has no cash value. Sixty-seven farmers interviewed killed an average of 12.7 tegus each during a summer hunting season, which they sold for a mean total of US$35, equivalent to 20 days wages for casual labour. The skins are sold to travelling merchants who usually pass them on to specialist exporters in Ascuncion (Norman, 1987). Illegal skin exports to Argentina are still continuing (G. Hemley, *in litt.*, 25 March 1986). Figures compiled by the Ministerio de Agricultura y Ganaderia showed exports in 1984 of about 91 000 skins of *T. teguixin* and 36 000 of *Tupinambis* spp. (Acevedo Gomez, 1987).

Peru Dixon and Soini (1986) reported that a large number of skins and several live *T. teguixin* were shipped from Iquitos each year.

Peru No information.

Suriname There is said to be no skin hunting in the country but skins are though to be smuggled over the border from Brazil (M.S. Hoogmoed, *in litt.*, 26 August 1987).

Trinidad and Tobago No information.

Uruguay *Tupinambis* is greatly affected by human activity in Uruguay. It is hunted for skins, meat or sport, often using dogs. The meat of the tail is particularly favoured, although it only provides an "occasional human meal". In some localities it is considered a pest and is blamed, probably incorrectly, for raiding eggs from chicken houses (Gudynas, 1981). The species is also affected by habitat destruction, particularly from hydro-electric dams and new forest plantations (Gudynas, 1981).

Venezuela *Tupinambis* is persecuted by rural people in Venezuela, as it is suspected of raiding chicken houses (Ramo and Ayarzaguena, 1983). There is not thought to be any systematic exploitation (Venezuela CITES MA, 1987).

Table 1a Minimum net imports of *Tupinambis* skins reported to CITES.

	1980	1981	1982	1983	1984	1985
Albania	-	1201	-	-	-	-
Australia	4	-	1075	50	-	-
Austria	3972	13756	25276	24000	14671	17957
Belgium	6	-	22	25232	-	12913
Canada	25712	20393	1464	10864	33013	40481
	-	892 m	-	837 m^2	-	-
Chile	-	3	-	-	-	-
China	-	-	-	-	-	5000
Colombia	14000	33977	14515	-	-	-
Cyprus	79	-	-	-	-	-
Egypt	-	2600	-	-	-	-
France	-	-	124	-	1122	115179
German D.R.	-	-	-	8 m^2	-	-
Germany, F.R.	22747	3075 m	22347	96729	-	-
Greece	5454	590	409	180	1474	2793
Hong Kong	12028	35809	32603	14406	88242	10042
	3409 kg	-	68 kg	3900 kg	3644 kg	10 kg
Hungary	557	-	-	-	-	-
Ireland	216	-	-	-	-	-
Italy	202402	321853	452506	282436	302660	113439
	-	301 kg	16 kg	1000 m	-	-
Japan	-	1504 kg	-	12452 kg	14783 kg	1873 kg
Lebanon	2775	1507	-	2300	131	-
Kuwait	-	-	-	-	-	1
Malaysia	-	-	-	-	-	124
Mexico	12515	46800	34144	106414	100966	47428
	5 kg	114 kg	1481 kg	261 kg	202 kg	770 kg
	21 m^2	266 m^2	-	-	52 m^2	-
Netherlands	32	-	-	-	-	-
New Zealand	-	-	2	-	-	-
Panama	1	-	-	75203	-	-
Paraguay	-	-	-	-	-	10651
Portugal	80	-	-	-	-	-
S. Arabia	-	-	-	4	39	3
S. Africa	1515	5683	100	4	-	-
	-	-	-	786 m	-	-
S. Korea	-	-	6	-	4621	21950
Spain	-	-	-	80854	70003	96515
Sweden	-	-	2	-	-	-
Switzerland	27856	65796	49971	20354	26561	37154
		-	-	46 m^2	-	-
Taiwan	-	-	-	-	24202	12270
Turkey	-	-	-	50	33	1000
UK	76160	6996	5 m	25099	-	16074
USA	1454299	3044137	1128277	772640	1465389	918468
	20297 m	9806 m	106 m	-	2 m	318 m
Uruguay	-	-	-	2025	260	-
Venezuela	1895	1615	1333	1400	2230	1800
Unknown	4100	1372	22834	-	-	-
Total	1868405	3604088	1787010	1540244	2135617	1481242
	3414 kg	1919 kg	1565 kg	16613 kg	18629 kg	2653 kg
	20297 m	13773 m	111 m	1786 m	2 m	318 m
	21 m^2	266 m^2	-	891 m^2	52 m^2	-

Tupinambis spp.

Table 1b. Minimum net commercial imports of live *Tupinambis* reported to CITES.

	1980	1981	1982	1983	1984	1985
Austria	1	10	-	-	4	4
Belgium	-	-	20	-	-	1
Canada	5764	29	46	23	59	135
Denmark	15	6	-	5	39	6
German D.R.	-	-	-	-	-	2
Germany, F.R.	223	231	247	162	225	309
Israel	-	-	3	1	-	2
Italy	-	4	14	43	-	20
Japan	12	98	69	66	69	21
Mexico	10	-	-	-	-	-
Netherlands	4	12	-	-	2	55
New Zealand	2	-	-	-	-	-
Poland	-	-	-	-	20	-
S. Korea	-	-	-	-	5	-
Spain	-	6	2	18	-	-
Sri Lanka	-	-	-	2	-	-
Switzerland	68	70	60	27	-	12
UAE	-	-	3	-	-	-
UK	-	179	202	209	229	201
USA	571	1867	1811	2539	2569	2731
Total	6670	2512	2477	3095	3221	3499

INTERNATIONAL TRADE There have been several analyses published in recent years which include details of international trade in *Tupinambis* skins (Anon., 1983; Hemley, 1984; Mares and Ojeda, 1984). Most have been based either on the Annual Reports of Parties to CITES or on the reported exports from Argentina. The CITES reports are summarised in Tables 1 and 2; only trade in live animals and skins was considered and all reports of *Tupinambis* spp., *T. rufescens*, *T. teguixin* and *T. teguixin nigropunctatus* were lumped together.

Minimum net trade in skins of *Tupinambis* (Table 1a) varied from over 1 481 000 to over 3 600 000 between 1980 and 1985. Trade reached a peak in 1981, and subsequently declined (see also Hemley, 1984), although there was an increase in 1984. The main importing countries have been the USA, Canada, Mexico, Hong Kong, and several European countries, especially Italy, France, F.R. Germany, Austria, UK and Spain. It should be noted that France did not report imports of Appendix II species before 1984, and, as it was a major importer in 1985, the totals shown in the earlier years in Table 1a may be artificially low. Japan has usually featured as a net exporter of skins, indicating that large numbers of skins are imported and subsequently re-exported, presumably after tanning. The minimum net imports of live *Tupinambis* (Table 1b) have varied between 2477 and 6670, and are therefore insignificant in comparison with the skin trade. The major net importing countries have been the USA, Canada, F.R. Germany and the UK.

Table 2a. Reported countries of origin or export for commercial exports of skins of *Tupinambis* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries with wild populations of *Tupinambis*						
Argentina	1263395	1890834	894490	1070300	1448929	1312881
	3414 kg	1714 kg	1050 kg	2561 kg	2013 kg	780 kg
	–	3936 m	111 m	–	3 m	318 m
	29 m^2	263 m^2	–	–	52 m^2	1 m^2
Bolivia	–	–	–	99999	12500	130301
Brazil	30	137000	551	–	8	238
Colombia	535	16817	2062	10132	318	3500
Paraguay	604926	1893658	731854	465464	329529	59203
	–	301 kg	515 kg	12739 kg	16013 kg	1873 kg
	20297 m	–	–	1786 m	–	–
Peru	5371	–	–	–	–	–
Uruguay	–	–	59355	–	6000	3413
Countries without wild populations of *Tupinambis*						
Canada	4	3	4	1	–	–
France	13973	9619	–	–	–	–
Germany, F.R.	489	12818	–	–	–	–
	–	590 m	–	–	–	–
Indonesia	820	2250	–	–	–	–
Italy	18224	37876	–	–	–	–
Japan	–	64740	–	4849	1946	26500
	–	6172 m	–	–	–	–
Panama	2	–	213189	71392	10830	–
Netherlands	1980	–	–	–	–	–
Nigeria	2884	–	–	–	–	–
Singapore	–	3612	–	–	–	8000
S. Korea	–	5280 m	–	–	–	–
Spain	12876	13303	–	–	–	–
Sweden	1000	–	–	–	–	–
Switzerland	–	–	27	–	–	–
Thailand	7	–	–	–	–	–
UK	3438	17013	532	1010	1357	–
USA	9249	508	751	16629	5189	8020
	–	–	–	1764 kg	–	–
Unknown	40125	73865	64579	55846	150826	1825
	–	3801 m	–	865 m^2	603 m	–

The apparent countries of origin of the skins in trade are shown in Table 2a. These show that Argentina was the major exporter in all years except 1981, when Paraguay took over this position. Exports from Argentina have varied between 0.8 million and 1.9 million. This is remarkably consistent with the trade revealed by the Argentinian Customs export statistics quoted by Mares and Ojeda (1984), which showed annual exports between 0.7 million and 1.6 million from 1976 to 1979. Other major source countries in South America have been Paraguay, Brazil, Colombia, Uruguay and Bolivia. The 99 999 skins in 1983, country of origin Bolivia, were reported as an import to the USA from Haiti, but is possible that the quantity was an error. Some 19 000 Paraguayan skins were imported from Haiti in the previous year, and there is known to be a reptile leather tannery in Haiti (G. Hemley, *in litt.*, 25 March 1986). Brazil, Paraguay and Uruguay all have bans on the export of wildlife products.

Tupinambis spp.

Table 2b Reported countries of origin or export for commercial exports of live *Tupinambis* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries with wild populations of *Tupinambis*						
Argentina	4031	–	1	2	48	241
Bolivia	2	–	–	10	408	–
Brazil	–	–	–	–	–	6
Colombia	108	763	1	–	–	–
Fr. Guiana	–	1	–	–	–	–
Guyana	2570	1720	1916	2849	2637	2903
Paraguay	7	14	2	–	–	–
Suriname	–	10	20	190	95	43
Venezuela	–	–	–	–	5	–
Countries without wild populations of *Tupinambis*						
El Salvador	–	–	520	–	30	261
Germany, F.R.	10	–	–	–	–	–
Guatemala	22	–	–	–	3	–
Honduras	2	4	–	–	–	–
Italy	–	–	–	–	10	–
Panama	36	–	–	–	–	–
Thailand	4	–	–	–	–	48
Togo	–	10	–	–	–	–
UK	5	–	2	–	–	–
USA	7	–	31	16	3	–
Unknown	10	168	29	50	20	2

Most of the apparent exports from countries without wild populations of *Tupinambis* probably represent re-exports where the country of origin was not specified. Panama is notable as the source of considerable numbers of skins between 1982 and 1984, as it is known to feature as an entrepot for wildlife trade leaving South America (Vallester, 1978). A large tannery in Panama, which closed in 1985, was owned by an Argentinian skin trader (G. Hemley, *in litt.*, 25 March 1986). The majority of these were systematic errors, as neither Canada nor Switzerland reported countries of origin. The skins from Indonesia, Nigeria and Thailand may represent incorrectly identified *Varanus* skins. The source countries for the live *Tupinambis* are shown in Table 2b. Since 1980, the major supplier has been Guyana, which also supplies numerous other birds and reptiles to the European and North American pet trade.

Unlike many other South American wildlife products in trade, the majority of *Tupinambis* skins appear to have been legally acquired and exported from Argentina. However there are still very large quantities which have apparently originated in Paraguay, which has a total ban on wildlife exports. It is possible that some of the skins declared as originating in Bolivia also came from Paraguay. Argentina already has a management programme for *Tupinambis*, which sets quotas for skin hunting and export, although these may not be adequately enforced. Furthermore they cannot be related to knowledge of sustainable offtakes at present as the size of the wild population is not known. A research programme is under way to provide such information, and if this can be used to revise the quotas, then there is a good potential for establishing a rational and sustainable exploitation plan. The fact that *Tupinambis* populations are reported to be falling slowly in Argentina suggests that the current levels of exploitation are excessive, but not grossly so.

CONSERVATION MEASURES The legal protection status of *Tupinambis* spp. is summarised in Table 3.

Table 3 Legal prohibition on the commercial hunting, internal trade and commercial export of *T. teguixin*. Dates are those on which the legislation came into force. A - All live animals & parts; L - Live animals only; S - Skins; P - Allowed under permit; C - Closed seasons may be imposed; * - these territories are Overseas Départements of France with which the EEC may trade without the imposition of CITES controls; ? - no information (Fuller *et al.*, 1987).

	CITES	Hunting	Trade	Export
Argentina	1981	C	P	P
Bolivia	1979	-	S 1979	L 1984 +
Brazil	1975	A 1967	A 1967	A 1967
Colombia	1981	P	-	L 1978
Ecuador	1975	-	-	A 1981
Fr. Guiana	1978 *	-	A 1986	A 1986
Guyana	1977	-	-	A 1986 ++
Paraguay	1977	-	A 1975	A 1975
Peru	1975	P	A 1973	A 1973
Suriname	1981	-	-	P
Trinidad & Tobago	1984	?	?	P
Uruguay	1975	A 1978	A 1978	A 1978
Venezuela	1978	C	A 1970	A 1970

\+ Bolivia banned the export of all wildlife products from July 1985 for one year.
++ Export quotas of 7200 live *T. nigropunctatus* were suggested for 1987 and 1988.

Argentina Exports of raw skins are prohibited, and skins must be tanned or semi-processed (in crust). The harvest is regulated by the setting of quotas and closed seasons, which vary from province to province; neither mechanism appears to be effective (G. Hemley, *in litt.*, 7 March 1986). Attempts are being made to regulate the harvest on a Federal level; it is hoped to set a maximum total export quota of 1 million skins, but agreement from the provincial authorities has not yet been achieved (E.O. Gonzalez Ruiz, *in litt.* to G. Hemley, 12 March 1986). In Santiago del Estero, hunting is permitted all year round. The closed seasons rarely have any basis in a knowledge of the biology of the animal, and are set more for the convenience of the hunters. It was suggested that hunting should be prohibited during the breeding season (November to January), and that a minimum size limit of 20 cm be set (Donadio and Gallardo, 1984).

Uruguay *Tupinambis* is not specifically protected in Uruguay, although there is a blanket ban on wildlife trade. It was thought that population surveys and further conservation measures were needed to prevent further population decline (Gudynas, 1981).

CAPTIVE BREEDING *Tupinambis* is regularly kept in captivity, and has been successfully bred. A total of 48 animals in 21 different collections were listed in an international survey of 260 zoological collections in 1985 (Slavens, 1985).

Tupinambis spp.

A project is under way to investigate captive-breeding of *Tupinambis* in Formosa, Argentina, jointly co-ordinated by the provincial Government and a local tannery. Two other traders have started trying to breed *Tupinambis* in captivity in Argentina since 1985, but no results are available yet. *T. rufescens* adapts readily to captivity and tames easily (G. Hemley, *in litt.*, 7 March 1986). All of the breeding operations are still experimental, and do not have authorization to operate commercially. To achieve this they will need to comply with Resolution No. 144 (1983) on the rearing of species included in Appendix II (E.O. Gonzalez Ruiz, *in litt.* to G. Hemley, 12 March 1986).

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SAVANNA MONITOR

Recommended list: 2
[Possible problem]

Varanus exanthematicus (Bosc, 1792)

Order SAURIA

Family VARANIDAE

SUMMARY AND CONCLUSIONS A large diurnal lizard, widespread in sub-Saharan Africa, it has been recorded in: Angola, Botswana, Cameroon, Central African Republic, Chad, Ethiopia, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Kenya, Liberia, Malawi, Mali, Mauritania, Mozambique, Namibia, Nigeria, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Yemen A.R, Yemen P.D.R., Zaire, Zambia and Zimbabwe. It is likely to occur in Benin, Burkina, Djibouti, Niger and Swaziland, and may be found in Burundi and Rwanda. Inhabits typically savanna and open woodland habitats. The varied diet includes small vertebrates, eggs and invertebrates. No detailed information on population sizes and trends is available, but the species is said to be common in protected areas and other sparsely inhabited regions in southern Africa, and scarce in settled regions due to human predation. The same is likely to hold for northern parts of the range.

Widely used locally for food and for leather goods. Internationally, relatively small numbers are in the live animal trade, with an annual mean of some 1708 specimens in recent years, but very large numbers of skins are traded, an annual mean of 88 138 from 1980 to 1985. Nigeria has been the reported origin of most of these skins, with Mali, Sudan and South Africa also contributing large numbers in different years. Most of the live animals originated in Ghana, Kenya and Togo.

While there is no evidence that the species as a whole is threatened, this scale of exploitation, coupled with local utilisation and persecution, is likely to lead to local depletions. Field data on population status in selected countries are required.

DISTRIBUTION Widespread in Africa south of the Sahara, from Senegal east to Ethiopia and Somalia, and south through the continent to South Africa, but apparently absent from areas of tropical rain forest in west and central Africa (Loveridge, 1957; Mertens, 1942; Mertens, 1963, Schmidt, 1919). Specific records are sparse but the species has been recorded in: Angola, Botswana, Cameroon, Central African Republic, Chad, Ethiopia, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Kenya, Liberia, Malawi, Mali, Mauritania, Mozambique, Namibia, Nigeria, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Yemen A.R., Yemen P.D.R., Zaire, Zambia, Zimbabwe. It is likely to occur in Benin, Burkina, Djibouti, Niger and Swaziland, and may be found in Burundi and Rwanda.

Mertens (1942) recognised four subspecies: *V. e. exanthematicus* from Senegal to Egypt; *V. e. microstictus* from Ethiopia to Tanzania; *V. e. albigularis* from southern Africa; and *V. e. angolensis* which is confined to Angola and southern Zaire.

Angola Mertens (1942) noted the occurrence of *V. e. microstictus* and cited numerous records of *V. e. angolensis*.

Benin No records have been located, but the species is most likely to occur as it found in neighbouring countries, Togo and Nigeria.

Botswana Mertens (1942) cited several records of *V. e. microstictus*. It is particularly associated with the drier areas (Auerbach, 1985).

Burkina No records have been located, but the species is most likely to occur as it found in neighbouring countries, Togo, Ghana, Ivory Coast and Mali. *V. exanthematicus* is mentioned by name in the national legislation.

Burundi Mertens (1942) noted no localities in Burundi, but recorded *V. e. microstictus* from the Tabora District of Tanzania and from south-eastern Zaire.

Cameroon Two species of *Varanus* occur in Cameroon, *V. niloticus* and what is referred to as *V. griseus*, the "Varan de terre" (Tsague, 1986). *V. griseus* is also referred to in the national legislation. However, it is unlikely that *V. griseus* occurs in Cameroon as it is confined in Africa to the extreme north (Mertens, 1942), and it is most probable that "*V. griseus*" refers to *V. exanthematicus*. Mertens gave no localities for the country, but he cited records for *V. e. exanthematicus* as "Lake Chad", without specifying which shore. "*V. griseus*" is said to occur in Kalamaloué, Waza, Boubandjida, Benoué and Faro protected areas (Tsague, 1986), all of which are located in the north of the country.

Central African Republic *V. e. exanthematicus* was recorded from Batafango (Mertens, 1942).

Chad *V. e. exanthematicus* was recorded from around Lake Chad and Bahr el Ghazal (Mertens, 1942).

Djibouti No records have been located, but the species is most likely to occur as it found in neighbouring areas of Somalia (Simonetta and Magnoni, 1986) and Ethiopa.

Egypt Mertens (1942) noted one 1826 record from "Aegypten", but it seems unlikely that this refers to Egypt.

Ethiopia Mertens (1942) cited several records of *V. e. exanthematicus* from Eritrea and of *V. e. microstictus* from Abyssinia.

Gambia Records of *V. e. exanthematicus* noted by Mertens (1942), including MacCarthy Island in the Gambia River.

Ghana Mertens (1942) noted one record of *V. e. exanthematicus* from the Gold Coast and one from Jendi (=Yende) in what was then Togo but is now Ghana.

Guinea Klaptocz (1913) recorded *V. exanthematicus* from "Am Niger", French Guinea, presumably meaning the Niger River. Mertens (1942) cited another record of *V. e. exanthematicus* from Guinea.

Guinea-Bissau Recorded from Bissalanca, Brene and Tor, on Bissau Island; Canchungo, Pecixe and Pitche (Manaças, 1955). Records of *V. e. exanthematicus* were noted by Mertens (1942)

Ivory Coast *V. exanthematicus* occurs in Comoe National Park (Anon., 1979), and is likely to occur in other dry areas.

Kenya Numerous records of *V. e. albigularis* were noted by Mertens (1942), from Ludwar to Malindi.

Lesotho *V. exanthematicus* is said to be extinct in Lesotho (Lesotho, Ministry of Agriculture and Marketing, *in litt.*, 1986).

Liberia One record of *V. e. exanthematicus* was noted by Mertens (1942).

Varanus exanthematicus

Malawi Mertens (1942) noted records of *V. e. albigularis* from Nyassaland.

Mali *V. e. exanthematicus* was recorded from Tombouctou (Chabanaud, 1917) and Goundam (Angel, 1933), Kidal and north of Bamako (Mertens, 1942).

Mauritania Mertens (1942) cited Flower (1929) indicating that the distribution of *V. e. exanthematicus* extended from Mauritania to the Niles, though no records from Mauritania were given.

Mozambique Mertens (1942) cited records of *V. e. microstictus* from Chifumbazi and *V. e. albigularis* from Quitangonha, Sena, Tette and Pungwe River.

Namibia Numerous records of *V. e. albigularis* noted by Mertens (1942).

Niger *V. exanthematicus* is said to be "unknown" in Niger (Niger CITES MA, 1986). Mertens gave no localities for the country, but he cited records for *V. e. exanthematicus* as "Lake Chad", without specifying which shore.

Nigeria Said to occur throughout the savanna zone (Nigeria CITES MA, 1987). Dunger (1967) reported it to be common in grassland in the north.

Rwanda Mertens (1942) noted no localities in Rwanda, but recorded *V. e. microstictus* from the Tabora District of Tanzania and from south-eastern Zaire. *V. exanthematicus* is not mentioned in national legislation, although *V. niloticus* is.

Senegal Numerous records of *V. e. exanthematicus* noted by Mertens (1942).

Sierra Leone Reported to be present in the Outamba-Kilimi area, but no specimens were collected (Teleki, 1980).

Somalia *V. e. microstictus* has been recorded from Wewst Galbeed, Togdheer, Bari, Nugal, Mogadishu, Lower Shebelle, Bay, Gedo and Lower Jubba (Simonetta and Magnoni, 1986). Mertens (1942) cited numerous records.

South Africa Found throughout the country except in the western and southern Cape Province (McLachlan, 1978). Numerous records of *V. e. albigularis* noted by Mertens (1942).

Sudan Numerous records of *V. e. exanthematicus* were cited by Mertens (1942), including Dongola, Kordofan, Sennaar, Roseires, Blue and White Niles.

Swaziland No records have been located, but the species is most likely to occur as it found in neighbouring countries, South Africa and Mozambique.

Tanzania Numerous records of *V. e. microstictus* were noted by Mertens (1942), from the Tabora District to Lindi. Pakenham (1983) refutes the earlier records from the island of Zanzibar, but noted a sight record from the island which could have been of this species. Laurent (1964) described an endemic subspecies, *V. e. ionidesi*, from south-east Tanzania.

Togo Records of *V. e. exanthematicus* were noted by Mertens (1942), including Bismarckburg, Mangu, Basari and Sokodé.

Uganda One record of *V. e. microstictus* was cited by Mertens (1942).

Yemen Arab Republic Arnold (1986) noted the occurrence of *V. exanthematicus* from North Yemen, but said that no specimens had been collected from there. There is some dispute that the form occurring in Yemen

may represent a new species.

Yemen Peoples' Democratic Republic Two specimens were collected from El Khobar (Arnold, 1986).

Zaire *V. e. exanthematicus* was recorded from Mauda, in the north-east; *V. e. microstictus* from Kikondja, Kansenia, Lukafu, Kiambi and Lukulu in the south-east; and *V. e. angolensis* from Kabengere (Mertens, 1942).

Zambia *V. e. albigularis* was recorded from the "bank of Loangwa" and north of the Zambezi (Mertens, 1942). Said to be widespread, but most abundant in the Zambezi and Luanga valleys (Broadley, 1971).

Zimbabwe Numerous records of *V. e. albigularis* were noted (Mertens, 1942).

POPULATION Said to be still common in sparsely inhabited areas of southern Africa generally, including the Kalahari region, National Parks and cattle ranches, but scarce in densely populated communal land due to human predation (D.G. Broadley, *in litt.*, 18 March 1986). The same is likely to be true for other parts of the range. Little information is available for individual countries.

Botswana *V. exanthematicus* is said to be more common than *V. niloticus* around Gaberone (Auerbach, 1985).

Guinea-Bissau Said to have been common in 1896 (Manaças, 1955).

Kenya Common along the coast and in Tsavo East and Tsavo West National Parks (A.D. Mackay, *in litt.*, 26 March 1986).

Malawi Said to be uncommon and seldom seen (C. Dudley, *in litt.*, 14 April 1986).

Mali Said to have been very rare around Goundam (Angel, 1933).

Mozambique Uncommon in most areas, though there are good populations in conservation areas (Mozambique CITES MA, 1986).

Namibia Said to be abundant in some Nature Conservation Areas, such as Etosha, but marginal in others. Otherwise, scarce in heavily populated communal lands, but relatively common elsewhere (Namibia Department of Agriculture and Nature Conservation, *in litt.*, 1987).

Nigeria Said to be common, but threatened (Nigeria CITES MA, 1987). Formerly reported common in grassland in the north (Dunger, 1967).

South Africa Considered to be vulnerable outside game reserves, though common in reserves such as Ndumu and the southern Kruger Park (McLachlan, 1978). The species is said to be less common than *V. niloticus*, but often encountered in the larger Zululand reserves (South Africa CITES MA, 1987).

Uganda Said to be common in the north-east of the country, where cattle keep the grass short (Uganda Game Department, *in litt.*, 1987).

Zambia Said to be most abundant in the Zambezi and Luanga valleys (Broadley, 1971). Common in wooded savannas of Zambia and other parts of southern Africa, but threatened by utilisation and habitat changes (M.P. Simbotwe, *in litt.*, October 1983).

Varanus exanthematicus

Zimbabwe Still common in sparsely populated areas, though scarce in the densely populated communal lands due to predation (D.G. Broadley, *in litt.*, 18 March 1986).

HABITAT AND ECOLOGY A large diurnal lizard, up to nearly 1.5 m in length. Typically associated with dry areas, especially the variety of savanna-type habitats and *Brachystegia* woodland. Occupies animal burrows, holes in the ground or rock crevices, and may aestivate therein during acute drought. The diet mainly comprises small mammals and birds, but vertebrate eggs and invertebrates are also taken. In South Africa, the diet consists mainly of millipedes and tenebrionid beetles. An able swimmer; often climbs into trees when disturbed or while resting. Females lay a clutch of 30-40 eggs, ca 60 x 35 mm, in a hole which is covered over for the incubation period (Auerbach, 1985; Broadley, 1971; Dunger, 1967). Smaller clutches of 7-15 eggs are reported for *V. e. albigularis* (South Africa CITES MA, 1987).

THREATS TO SURVIVAL Apparently adversely affected by human predation for both food and skins (D.G. Broadley, *in litt.*, 18 March 1986; Dunger, 1967; M.P. Simbotwe, *in litt.*, October 1983). No details are available on the effect of these factors on lizard populations, or on their relative intensity in different parts of the continent.

Botswana There seems to be no large-scale commercial collecting although local food use is important (R.D. Auerbach, pers. comm., 1986).

Mozambique There has been very little commercial exploitation of the species over the last ten years, but it is hunted for food in rural areas, and human predation is said to be significant. Bush fires may also pose a threat (Mozambique CITES MA, 1986).

Namibia Although many *V. exanthematicus* are killed on roads, the species is not particularly sought after as food (Namibia Department of Agriculture and Nature Conservation, *in litt.*, 1987).

South Africa Said to be exploited for skins and pets. It is also often killed out of fear and is sometimes used by witchdoctors for medicinal purposes (McLachlan, 1978).

Uganda The species is not used for food in the north-east of the country, but is regarded as a delicacy in the West-Nile region. It is also persecuted as a notorious predator of chickens' eggs (Uganda Game Department, *in litt.*, 1987).

INTERNATIONAL TRADE CITES reports, summarised in Tables 1 and 2, indicate that large numbers of *V. exanthematicus* are involved in the skin trade. Reported quantities have ranged between 14 010 and 215 952 between 1980 and 1985, with an annual mean of 88 138. Nigeria has been the reported origin of most of these skins, with Mali, Sudan and South Africa also contributing large numbers in different years. Many of the skins were re-exported from F.R. Germany in 1985. It is not known whether skins exported from Nigeria are collected in that country or in other parts of West Africa. In the absence of good population information for any part of the range, the sustainability of trade cannot be assessed. Although local declines have been noted, there is no evidence that the species as a whole is significantly threatened.

Relatively small numbers of live animals (mostly from Ghana, Kenya and Togo) are in reported international trade, between 434 and 5448 from 1980 to 1985, with an annual mean of 1708; most of these were imported by the USA, with lesser numbers to F.R. Germany and other parts of Europe.

Table 1 Minimum net imports of skins of *Varanus exanthematicus* reported to CITES. Only transactions recorded by number of skins were included

	1980	1981	1982	1983	1984	1985
Albania	–	287	–	–	–	–
Australia	–	–	8	–	–	–
Austria	2835	4431	1044	6360	–	–
Belgium	329	–	–	–	–	–
Canada	1128	80	60	420	360	507
France	4517	5030	–	–	–	–
German D.R.	–	–	–	1	–	–
Germany, F.R.	37456	8363	–	–	–	–
Hong Kong	60	25709	486	–	450	–
Italy	29925	–	–	–	13113	302
Lebanon	24	–	–	–	–	–
Netherlands	–	–	1350	–	–	–
New Zealand	–	–	1	–	–	–
South Africa	248	72	100	–	–	–
Spain	–	–	–	7301	–	–
Switzerland	–	12007	3	–	8	–
Uruguay	–	–	22	–	–	–
UK	5018	–	–	9315	–	–
USA	30032	159973	15812	8692	–	143450
Yugoslavia	–	–	–	–	79	94
Country Unknown	–	–	300	–	–	–
TOTAL	111572	215952	19183	23760	14010	144351

Table 2 Reported countries of origin (or exporting country if no origin reported) and quantities of transactions in skins of *V. exanthematicus* reported to CITES.

	1980	1981	1982	1983	1984	1985
a. Countries with wild populations of *V. exanthematicus*.						
Mali	–	–	1	1460	–	–
Nigeria	118916	168810	19495	14340	153	143692
Sudan	–	1809	514	10366	–	60
South Africa	–	4418	–	–	13927	–
Senegal	–	849	–	–	–	–
b. Countries without wild populations of *V. exanthematicus*.						
Afghanistan	–	–	–	–	450	–
German D.R.	–	100	–	–	–	–
Germany, F.R.	2	–	–	–	–	–
Indonesia	–	14905	–	–	–	–
Philippines	–	2500	–	–	–	–
Singapore	–	5454	–	–	–	–
Thailand	–	2000	–	47	–	–
Togo	–	–	–	3	–	–
UK	6280	6806	–	420	10	–
Country Unknown	35960	28328	128	361	–	–

Varanus exanthematicus

CONSERVATION MEASURES Unless otherwise stated, all of the information on protection is from IUCN Environmental Policy and Law Occasional Paper No. 3, *African Wildlife Laws*.

Angola Not protected under the Hunting Regulations, 11 December 1955.

Benin Under the Decree concerning hunting and capturing licences, bag limits and professional hunters, 11 February 1980, Varanidae are designated as small game species. They may only be hunted by the holders of traditional hunting rights or under hunting permits.

Botswana The hunting of *Varanus* spp. is controlled under the Fauna Conservation (Unified Hunting) Regulations 12 March 1979, which set out the conditions of issue of hunting licences and the number of animals which may be taken by each hunter.

Burkina *V. exanthematicus* and *V. niloticus* are partially protected under the Wildlife Conservation and Hunting Act, 31 December 1968, which establishes bag limits and close seasons, protects nests and eggs, and regulates the sale of meat. Commercial capture and export are controlled under the same Act by Decree No 68-314. Ordonnance No 68-58, December 1985, fixed the open season from 15 December 1985 to 28 February 1986 and stipulated that partially protected species could only be hunted under special permit and only in the province of Gourma and Tapoa.

Burundi No information.

Cameroon *Varanus niloticus and Varanus griseus* (sic.) are partially protected under the Forests, Wildlife and Fisheries Act, 27 November 1981. They may only be taken under a valid hunting licence. No more than two animals may be taken in one day.

Central African Republic The Ordinance concerning the protection of wildlife and regulating hunting, 27 July 1984, designates *Varanus* as totally protected.

Chad No information.

Congo The Act concerning the conservation and exploitation of wild fauna, 21 April 1983, vests in the State ownership of all wild animals of economic value, and requires the issuing of licences for commercial capturing. A minimum size is set for the taking of *Varanus*, and fees are set for the issuing of certificates of lawful possession or export of monitor lizards. Under a later Order (18 May 1984), *Varanus flavescens* (sic.) is designated partially protected, and may therefore only be taken under a hunting licence.

Djibouti No information.

Ethiopia Under the Wildlife Conservation (Amendment) Regulations, 12 February 1974, *Varanus niloticus* and *Varanus exanthematicus* are protected. They may only be hunted for scientific purposes and require a special permit, the value of which was set at Eth$1.00 for each *Varanus*.

Gambia Under the Wildlife Conservation Act, 14 February 1977, all wildlife except game and vermin are protected.

Ghana The Wildlife Conservation Regulations, 4 March 1971, define *Varanus niloticus* as totally protected and *V. exanthematicus* as partially protected, for which hunting is permitted under licence during the open season.

Guinea No information.

Guinea-Bissau The Hunting Regulations, 12 May 1980, require the issuance of a licence for the capturing of live wild animals.

Ivory Coast *Varanus niloticus* and *V. exanthematicus* are listed as predatory animals in the Wildlife and Hunting Act, 4 August 1965, and may be hunted without licence anywhere except in protected areas. Arrêté No. 15, 26 December 1972, establishes licence fees for the capturing of live reptiles. Under the Order regulating the commercial hunting of crocodiles and monitor lizards, 29 September 1967, a special permit is required to capture monitor lizards for commercial purposes. The possession of specimens having a skin width of less than 25 cm is prohibited.

Kenya Protected by legislation in Kenya, export being banned (Legal Notice No. 152, 25 September 1981).

Lesotho *Varanus* spp. are totally protected under the Proclamation of Monuments, Relics, Fauna and Flora, 1969.

Liberia The Wildlife Conservation Regulation (in draft, 1985) lists *V. niloticus* as partially protected, thereby providing for closed seasons. Trade in and export of fully and partially protected species is prohibited except for educational or scientific purposes.

Malawi Hunting, possession, trade and export of game is controlled under the Game Act, 1953. No reptiles, other than crocodiles, are protected.

Mali All *Varanus* species are classified as game species under the Hunting Act, 11 November 1969. There is a general close season from 1 June to 31 October. A general hunting ban (Decree 325/PG-RM) throughout the country was imposed on 6 November 1978.

Mauritania Under the Hunting and Wildlife Protection Act, 15 January 1975, the capture, possession, sale and export of live wild animals requires a commercial capture permit. The sale of game meat is prohibited.

Mozambique *V. exanthematicus* is fully protected by national legislation. It occurs in Gorongosa National Park (Mozambique CITES MA, 1986).

Namibia Protected by the Nature Conservation Ordinance (Namibia Department of Agriculture and Nature Conservation, *in litt.*, 1987).

Niger All hunting for utilitarian purposes has been prohibited in Niger since 1972 (Niger CITES MA, 1986).

Nigeria *V. niloticus* and *V. exanthematicus* are listed as fully protected in the Endangered Species (control of International Trade and Traffic) Decree, 20 April 1985. Their hunting, capture, trade and export is prohibited. On 28 May 1982, the CITES Secretariat sent a notification (No. 218) to all Parties requesting them not to accept imports from Nigeria as the Nigerian Management Authority did not issue any export permits.

Rwanda *Varanus niloticus* is partially protected under the Hunting Regulations, 31 December 1974. A licence is required for hunting and close seasons may be set.

Senegal The Game and Wildlife Protection Regulations, 30 May 1967, lay down regulations governing the issuance of licences for hunting and commercial capturing of wildlife.

Sierra Leone All species of *Varanus* are listed as prohibited animals in the Wildlife Conservation Act, No. 27, 1972. It is illegal to hunt or possess them.

Somalia *Varanus* are listed as game animals under the Law on Fauna (Hunting) and Forest, 25 January 1969. They may only be hunted or exported under licence. A ban on all hunting was instituted on 13 October 1977.

South Africa *V. exanthematicus* is legally protected in the Cape Province, Natal and partially in the Transvaal (McLachlan, 1978). Occurs in 14 out of 60 reserves and resorts in Natal (South Africa CITES MA, 1987).

Sudan *V. exanthematicus* and *V. niloticus* are listed in the Ordinance for the Preservation of Wild Animals, 1935 (Amended 1974), as species for which hunting is permitted. Licences are only required if firearms are used for hunting. The Hides and Skins (Export) Regulations, 1969, specify a grading system for the export of reptile skins.

Swaziland Apparently no reptiles are protected in Swaziland.

Tanzania Under the Wildlife Conservation Act, 30 June 1974, the capture of all live animals requires a valid capture permit, and the hunting of all animals requires a valid hunting permit.

Togo *V. exanthematicus* and *V. niloticus* are classified as pest species under the Ordinance on Wildlife Protection and Hunting, 16 January 1968. An enabling decree, dated 4 June 1980, sets out licence fees for hunting and commercial capture, but there is no bag limit for these species.

Uganda No reptiles, other than crocodiles, are protected.

Zaire The commercial capture of unprotected animals requires a permit under the Hunting Act, 28 May 1982. Export can only be authorised if the exporter holds a certificate of lawful possession.

Zambia *V. exanthematicus* and *V. niloticus* are listed as game animals in the National Parks and Wildlife Act, 3 December 1968, under which their hunting, possession, trade and export are controlled and fees are set for the export of trophies and live animals.

Zimbabwe The collection of live reptiles and their eggs and their breeding in captivity are controlled under licence by the Parks and Wildlife (General) Regulations, 1981.

CAPTIVE BREEDING A recent inventory lists 26 specimens in 16 collections in 1984 (Slavens, 1985); breeding is recorded in Rotterdam Zoo in 1979 (Olney, 1982).

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PACIFIC or MANGROVE MONITOR

Recommended list: 3*
[No problem]

Varanus indicus (Daudin, 1802)

Order SAURIA

Family VARANIDAE

* The category has been changed from list 2 to 3 since approval by the CITES Technical Committee meeting, 1986, owing to the absence of recent trade.

SUMMARY AND CONCLUSIONS A moderately large monitor lizard, rather widespread in the western Pacific. Ranges from eastern Indonesia, east through New Guinea to the Solomon Islands, south to northern Australia and north to several island groups in Micronesia (much of the present distribution here is due to introduction by man, often as late as World War II). Said to be less common than previously in some places, but also reportedly common in Papua New Guinea and parts of the Solomons and Guam. Prefers semi-open areas to dense forest, often along the littoral and in mangroves, often in coconut plantations. Has been shown to feed on various pest species, such as Giant African Snails, and rats in coconut plantations (and has been examined as a possible rat control agent), but widely regarded as a pest itself due its habit of feeding on chickens and other human food items.

Apparently not heavily exploited and probably not in excessive numbers in international trade. CITES Annual Reports show that the only substantial trade was 13 080 skins from Indonesia in 1980, since when trade has been negligible.

Although it is unlikely that international trade at the reported levels poses a significant threat to the species, it would be advisable to obtain data on population levels and exploitation rates, particularly for Indonesia.

DISTRIBUTION A western Pacific species, ranging from eastern Indonesia north-east to the Marianas and Marshall Islands, and east through New Guinea and northern-most Australia to the Solomon Islands. The natural range in Micronesia is uncertain; the species is known to have been very widely introduced in the region, during the German administration prior to WW1 and by Japanese and U.S. forces around WW2, and quite possibly at various times previously by the indigenous population of the region (for use as food). Present in the following countries, with details of distribution where available. Three subspecies have been recognised: *V. i. spinulosus*, which is confined to "Georges Island" in the Solomon Islands; *V. i. kalabeck*, which is confined to Waigeo Island, Indonesia; and *V. i. indicus*, which occupies the remainder of the range (Mertens, 1942).

Australia Rainforest and coastal mangroves of eastern Cape York Peninsula (Queensland), coastal mangroves of Arnhem Land (Northern Territory), and the islands of Torres Straits (Cogger, 1975; Cogger *et al.*, 1983).

Federated States of Micronesia Present on Kosrae, Mortlock, Woleai, Ifalik, Yap (Dryden, 1965; Uchida, 1966); also found on Ulithi and several islands in the Truk Atoll (USA CITES MA, 1987).

Guam Present (Dryden, 1965; Dryden and Taylor, 1969; USA CITES MA, 1987).

Indonesia Apparently widespread in the eastern sector of the archipelago, including Irian Jaya and adjacent islands, north to the Talaud group and west to Halmahera and the Moluccas (Ambon, Buru, Seram etc.) and Timor in the Lesser Sundas. De Rooij (1915) includes Sulawesi within the range of this species but Mertens (1963) does not.

Mariana Islands Present on Agiguan, Rota, Tinian, Sarigan, Saipan, (Dryden, 1965, Uchida, 1966) and on some of the islands north of Sarigan (USA CITES MA, 1987); no information on other islands in the group.

Marshall Islands Introduced into Japten before WW2 (Dryden, 1965); no information on other islands in the group.

Palau Present on Ngeaur (Angaur), Oreor (Koror), Babeldaob (Babelthaup), Ncheangel (Kayangel) (Dryden, 1965, Uchida, 1966).

Papua New Guinea Occurs widely throughout the main island and the island provinces (Whitaker *et al.*, 1982).

Solomon Islands Widespread, including the main islands of Guadalcanal, Isabel, Malaita, San Cristobal, (McCoy, 1980) but apparently not recorded from Choiseul or New Georgia.

POPULATION A popular source (Schmidt and Inger, 1957) states that this species is not as abundant as it once was on Pacific islands. Published comments on status are given below, but no adequate population estimates appear to be available for any part of the species's range.

Australia The species is said to be uncommon although there is no information on population size. It is encountered infrequently in the wild but populations are considered to be stable (Australia CITES MA, 1986).

Federated States of Micronesia Fairly common on islands where they occur (USA CITES MA, 1987).

Guam Relatively abundant in the northern sector (Dryden and Taylor, 1969).

Indonesia No information.

Mariana Islands Relatively abundant on Agiguan; relatively common in uninhabited forested areas on Rota and Saipan; uncommon on Tinian (USA CITES MA, 1987).

Marshall Islands No information.

Papua New Guinea Reportedly the most common of the six *Varanus* species in PNG (Whitaker *et al.*, 1982)

Solomon Islands Uncommon on most of the larger islands but can occur as large populations on many smaller islands, such as the Olu Malau group (McCoy, 1980).

HABITAT AND ECOLOGY An active diurnal lizard, relatively large in size, growing to around 1.5 m total length (50 cm body length). Olive-brown to near black dorsally, patterned with small evenly arranged yellow spots. Mainly terrestrial, but an able climber and fond of water. In northern Australia at least (Bustard, 1970) said to rest on trees overhanging water into which it dives when alarmed. Often found near the sea or in mangrove swamps; prefers semi-open areas to dense forest and in many places frequents coconut plantations.

In the Solomons, grapsoid crabs in the littoral zone form a major part of the diet (McCoy, 1980); this may well be true elsewhere in the range. Also feeds on small lizards and snakes, small mammals, sea turtle eggs, sometimes birds and their eggs. A study on Guam (Dryden, 1965) showed that *V. indicus* there fed mainly on animals often regarded as contrary to human interests, such as

the introduced Giant African Snail *Achatina* sp., rats, shrews and hermit crabs. However, in Micronesia generally, *indicus* is persecuted for its habit of feeding on chickens, land crabs and coconut crabs, all used as human food (Uchida, 1966).

The eggs (five in a captive female) are laid under decaying ground vegetation, or in rotting timber; hatchlings feed on insects and small scincid lizards.

THREATS TO SURVIVAL Available information does not suggest any confirmed threats to the species, although data are sparse for much of the range. Probably affected locally by persecution, in particular for its real or alleged stock-raiding activities. Some Aboriginal or Torres Strait Island communities may use the species for food (Australia CITES MA, 1986).

Table 1 Minimum net imports of live animals (L) and skins (S) of *V. indicus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Australia	-	-	2 L	-	-	-
Austria	150 S	-	-	-	-	-
Belgium	-	51 S	-	-	-	-
Denmark	2 L	-	-	-	-	-
France	12295 S	-	-	-	-	-
Japan	-	-	-	-	-	4 L
Switzerland	645 S	3014 S	-	-	-	-
UK	-	-	-	-	2	-
USA	2 L	120 S	100 S	-	3	-
TOTAL	4 L	-	2 L	-	-	4 L
	13080 S	3185 S	100 S	-	-	-

Table 2 Reported countries of origin (or exporting country if no original source reported) and quantities of transactions in live animals (L) and skins (S) of *V. indicus* reported to CITES.

	1980	1981	1982	1983	1984	1985
a. Countries having wild populations of *V. indicus*						
Indonesia	2 L	-	-	-	-	-
	12590 S	120 S	-	-	-	-
Papua New Guinea	-	-	-	-	-	4 L
b. Countries not having wild populations of *V. indicus*						
Chad	645 S	3185 S	100 S	-	-	-
India	500 S	17 S	-	-	-	-
Singapore	-	-	2 L	-	-	-
Thailand	2 L	-	-	-	-	-

INTERNATIONAL TRADE CITES Annual Reports (Tables 1 and 2) show that there has been very little international trade in *V. indicus* since 1980. In that year there was an export from Italy to France of 12 440 skins of Indonesian origin and another of 645 skins from France to Switzerland. Since then, most of the trade reported to have been of this species has been declared to have originated in Chad (Table 2), and was therefore probably misidentified. There has been a negligible trade in live animals.

It seems unlikely that the species could be seriously affected by present levels of exploitation, although local populations could perhaps be so affected, and no population data are available for Indonesia, the source of the majority of specimens reported to CITES. However, the population information at hand does not provide an adequate basis for recommendations for management or for expanding trade volumes.

CONSERVATION MEASURES

Australia Export for commercial purposes is prohibited under the Wildlife Protection (Regulation of Exports and Imports) Act (Australia CITES MA, 1986).

Indonesia Protected since 1978 (Indonesia CITES MA, 1986).

CAPTIVE BREEDING A recent inventory (Slavens, 1985) reports 10 individuals in four collections in 1984, with breeding in one group.

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NILE MONITOR

Recommended list: 2
[Possible problem]

Varanus niloticus (Linnaeus, 1766)

Order SAURIA

Family VARANIDAE

SUMMARY AND CONCLUSIONS A large diurnal lizard, occurring virtually throughout sub-Saharan Africa (except the arid south-west). Has been recorded in: Angola, Benin, Botswana, Cameroon, Central African Republic, Congo, Egypt, Ethiopia, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Ivory Coast, Kenya, Lesotho, Liberia, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Zaire, Zambia, Zimbabwe. Probably present in: Burkina, Burundi, Chad, Djibouti, Rwanda, Swaziland, and possibly in the extreme south of Algeria. Typically found in association with rivers, streams, lakes and other permanent water sources. Often common, especially in protected areas and areas with sparse human activity, but utilisation for food and skins is widespread and the latter in particular poses a threat to local populations.

A substantial skin trade was reported to CITES, with an annual mean of 408 292 between 1980 and 1985. The skins were mostly imported to Europe, especially France, Italy, Switzerland and F.R. Germany. Most originated in Mali, Nigeria, Sudan and Cameroon. Relatively small numbers of live animals were reported international trade, with an annual mean of 816 from 1980 to 1985.

While the species as a whole is not threatened, exploitation appears to be a cause of local depletion. Field information on population status and trends is required to help assess the long-term sustainability of the present high trade levels.

DISTRIBUTION Very widespread in sub-Saharan Africa from Mauritania in the west, eastward through Mali, Niger and Sudan, and south almost throughout the continent to South Africa's Cape Province, but generally absent from desert areas. Penetrates north of the Sahara into Egypt down the Nile valley. Has been recorded in: Angola, Benin, Botswana, Cameroon, Central African Republic, Congo, Egypt, Ethiopia, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Ivory Coast, Kenya, Lesotho, Liberia, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Uganda, Zaire, Zambia, Zimbabwe. Probably present in: Burkina, Burundi, Chad, Djibouti, Rwanda, Swaziland, and possibly in the extreme south of Algeria.

Mertens (1942) recognised two subspecies, *V. n. niloticus* in the larger, drier, part of the range, and *V. n. ornatus* in forest areas of West Africa, its distribution partly interrupted on the Guinea coast by the nominate form.

Algeria Mertens (1942) gave a record from Adrar Mountain, which is in southern Algeria; however as this is an extremely arid area, it is likely that the term may refer to the Adrar region which extends into northern Mali along the edge of the Niger drainage.

Angola Manaças (1955) listed localities from Angola, including Rio Quilo, Cabinda, Luanda, Rio Cuando, Mayumba, Duque de Bragança, Dondo, Rio Cuanza, Hanha, N'dala Tando, Golungo Alto, Kuvangu and Rio Mbalé. *V. n. ornatus* is said to occur on the Loango coast in what is now Cabinda, while the nominate subspecies occurs elsewhere in the country (Mertens, 1942).

Benin Recorded from Agouagon and Haut-Dahomey (Chabanaud, 1917). Mertens (1942) cited records of *V. n. niloticus* from Ajuda, Agouagon, and Haut Dahomey.

Botswana Present along rivers and near permanent water, but absent from the true Kalahari (Auerbach, 1985). *V. n. niloticus* has been recorded at Maun and along the Chobe River (Mertens, 1942).

Burkina No records have been located, but the species almost certainly occurs in the country as it is listed in the national legislation and is found in the surrounding countries, Mali, Ivory Coast, Ghana, Togo, Benin and Niger.

Burundi No records from Burundi have been located, but the species almost certainly occurs there, because Mertens (1942) gives records of *V. n. niloticus* from Luvungi and Uvira in Zaire and Ujiji in Tanzania all less than 20 km from the Burundi border.

Cameroon *V. niloticus* is said to occur in Kalamaloué, Boubandjida, Benoué, Faro and Douala-Edéa protected areas (Tsague, 1986), all of which are located in the north of the country, except for the last, which is on the coast. Mertens (1942) listed many localities for *V. n. ornatus*.

Central African Republic Mertens (1942) quoted a record from Avakubi in "Central Africa" which may represent the CAR and another from Fort Sibul in "French Equatorial Africa.

Chad *V. niloticus* occurs in Kalamaloué in northern Cameroon (Tsague, 1986) and therefore almost certainly occurs in Lake Chad.

Congo *V. n. ornatus* is widespread (Congo CITES MA, 1986), occurring at numerous localities, including Brazzaville and Niari (Mertens, 1942).

Djibouti No records have been located from Djibouti but the species occurs in the Awash River of Ethiopia (Neumann, 1905), and may therefore extend down to Lake Abbe on the Djibouti border.

Egypt *V. n. niloticus* occurs along the Nile as far north as Giza, just upstream of Cairo (Flower, 1933).

Equatorial Giunea *V. n. ornatus* occurs on the island of Bioko and has been recorded on the mainland at Cap Saint-Jean (Mertens, 1942).

Ethiopia Neumann (1905) noted the fisrt record of *V. niloticus* from the river-less "Hauasch" region, which probably refers to the Awash. Other records from Ethiopa are from the west, from the Blue Nile and the Akobo Rivers.

Gabon Said to be distributed more or less uniformly throughout the country (Gabon, Ministere des Eaux et Forets, *in litt.*, 29 November 1985). *V. n. ornatus* has been recorded at numerous localities in Gabon, including Setto Kama, and Lambaréné (Mertens, 1942).

Gambia *V. n. niloticus* occurs in Gambia, including on MacCarhty Island (Mertens, 1942).

Ghana Mertens (1942) cited records of *V. n. niloticus* from the Goldcoast, including Abruri, Akropong, Elima and Accra.

Guinea *V. n. ornatus* is said to occur on the west coast of Guinea (Mertens, 1942). Chabanaud (1921) said the species was widespread.

Guinea-Bissau Recorded from Brene and Bijimita, on Bissau Island; Formosa and Bambadinca (Manaças, 1955).

Ivory Coast Recorded from Ivory Coast (Chabanaud, 1917). Occurs in Comoe National Park (Anon., 1979)

Kenya Said to be present in all rivers and freshwater lakes in Kenya below about 5000 feet (1500 m) (A.D. Mackay, *in litt.*, 26 March 1986). Mertens (1942) listed many localities for *V. n. niloticus*.

Lesotho The species is said to occur in the country (Lesotho Ministry of Agriculture and Marketing, *in litt.*, 23 January 1986).

Liberia Said to occur throughout the country (Liberia CITES MA, 1986). Mertens (1942) cited records of *V. n. niloticus* from Monrovia, Lenga Town, Farmington River, Gbanga and Ganta. *V. n. ornatus* has been recorded at Cape Mount, Monrovia, Cavally River, Tala, Javillo, Mahfah River and Fisherman's Lake (Mertens, 1942)

Malawi *V. n. niloticus* occurs at many places along the west shore of Lake Malawi (Mertens, 1942), and along the Shire River (C. Dudley, *in litt.*, 14 April 1986).

Mali *V. n. niloticus* occurs in the Adrar Mountain Region in the north and at Bourem (Mertens, 1942).

Mauritania Mertens (1942) cited Flower (1929) indicating that the distribution of *V. n. niloticus* extended from Mauritania eastwards, though no records from Mauritania were given. The species certainly occurs on the south bank of the Senegal River at Bakel.

Mozambique *V. niloticus* said to be found throughout the country, having a wider distribution than *V. exanthematicus* (Mozambique CITES MA, 1986). Manaças (1955) listed localities from Mozambique, including Cabeceira, Boror, Quelimane, Tete, Beira, Lumbo, Caia and Charre.

Namibia The species only occurs along the rivers bordering the north and south of the country, and in the Caprivi Strip. The distribution extends to the mouths of the rivers (Namibia Department of Agriculture and Nature Conservation, *in litt.*, 9 March 1987).

Niger *V. niloticus* occurs along the Niger River and around other permanent water courses and lakes (Niger CITES MA, 1986).

Nigeria Associated particularly with the forests of southern Nigeria and the riverain forest of the savanna zone; recorded from Lagos, Umuahia, Claabar, Egbe, Mokwa, Makurdi, Jos, Bauchi and Malam Fatori (Dunger, 1967). Mertens (1942) provided records of *V. n. niloticus* from Benoué and Lagos, and of *V. n. ornatus* at Warri, Sapelli, Calabar and the Niger Delta.

Rwanda No records from Rwanda have been located, but the species almost certainly occurs there, because Mertens (1942) gives records of *V. n. niloticus* from Rutshuru in Zaire, less than 40 km from the Rwanda border. He also cites a probable record from Lake Kiwu, half of which is in Rwanda.

Sao Tomé and Principe *V. n. ornatus* occurs on the island of Principe (Mertens, 1942).

Senegal Numerous records of *V. n. niloticus* from Senegal were quoted by Mertens (1942), extending up to Bakel on the Senegal River.

Sierra Leone Present in the Outamba-Kilimi and Mamunta-Mayoso areas (Teleki, 1980). Mertens (1942) cited records of *V. n. niloticus* from Freetown and the Grand-Galbar River.

Somalia Recorded from the Shebelle and Juba Rivers and the region of Ola Uager (Simonetta and Magnoni, 1986).

South Africa In the Cape Province, the species extends along the south coast no further west than the Gamtoos River valley. It also extends along the Orange River to the Atlantic coast in the north (Branch and Braack, 1987). Widespread in Natal; also present in the Transvaal, Transkei and the Orange Free State (Mertens, 1942).

Sudan *V. n. niloticus* was said to occur along the Nile in the provinces of Halfa, Dongola, Berber and Khartoum, and up the Blue Nile as far south as Roseires. It was not seen on the main White Nile, but was found on the Bahr el Gebel and the Bahr el Zeraf as far south as Lado (Flower, 1933).

Swaziland No records have been located, but the species almost certainly occurs as it is found in neighbouring parts of South Africa and Mozambique.

Tanzania Occurs on Zanzibar Island but not on Pemba (Pakenham, 1983), also on Mafia Island and at numerous localities on the Mainland from the coast to the western border (Mertens, 1942).

Togo *V. n. ornatus* occurs at several localities, including Bismarckburg and Sebbe. *V. n. niloticus* was indicated at Tabligbo, Ancho-Bezirk, Sokodé, Mangu, Bogu and Moba (Mertens, 1942).

Uganda The species is widely distributed along all river systems, particularly those connected with the Nile, and all lakes (Uganda Game Department, *in litt.*, 28 March 1987). Mertens (1942) cited records of *V. n. niloticus* from Uganda, including the Sesse Islands, Entebbe, and Murchison Falls.

Zaire Mertens (1942) cited records of *V. n. niloticus* from Gamangui, Niangara, Niapu, Ngayu, Poko, Uvira, Luvungi, Eala, Koteli, Mahagi, Faradje, Medje, Panga, Buta, Stanleyville, Leopoldville, Kikondja, Nyonga, Kansenia, Kakyelo, Lukafa, Kasenga, Kando, Kiato, Kiambi, Leopoldville, Katobwe and Ekibondo. *V. n. ornatus* appears to be confined to the more eastern regions, including Banana, Loango, Kituri, Katanga, Mayumbé, Upoto, Maringa (Mertens, 1942).

Zambia Found wherever there are permanent rivers and streams (Broadley, 1971). Mertens (1942) cited records from the Zambezi and Luangwa rivers.

Zimbabwe Common in and around large rivers and lakes (D.G. Broadley, *in litt.*, 18 March 1986). Mertens (1942) gave records from the Zambezi and Matabele Land.

Varanus niloticus

POPULATION Little information is available on population trends or current status. In southern Africa generally, said to be very common in and around large rivers and lakes, and not threatened except where exploitation for the skin trade is allowed (D.G. Broadley, *in litt.*, 18 March 1986).

Cameroon No surveys have been carried out, but the species is said not to be in danger of extinction (Cameroon CITES MA, 1987).

Egypt *V. niloticus* was said to be fairly numerous in the Nile in the El Derr district and around Abu Simbel, becoming rarer further downstream (Flower, 1933).

Gabon Said to be more numerous along the coast where human predation is less severe (Gabon Ministere des Eaux et Forets, *in litt.*, 29 November 1985).

Guinea Said to be very common throughout Guinea (Chabanaud, 1921).

Kenya Apparently still abundant at least around Lake Victoria (A.D. Mackay, *in litt.*, 26 March 1986).

Malawi The species is said to be very common around Lake Malawi and in the Shire River (C. Dudley, *in litt.*, 14 April 1986).

Mozambique *V. niloticus* said to be more abundant than *V. exanthematicus* and to be especially common in the National Parks and Game Reserves (Mozambique CITES MA, 1986).

Niger *V. niloticus* is said to be fairly common in suitable habitat (Niger CITES MA, 1986).

Nigeria Common, formerly at least, in forests of southern Nigeria and in the riverain forest of the savanna zone (Dunger, 1967).

Somalia Relatively abundant in Somalia (Fagotto, 1985).

South Africa Said to be common and widespread in Natal (South Africa CITES MA, 1987).

Sudan The species was described as "not uncommon" on the main Nile in the north, and "really numerous" on the Blue Nile between Wad Medani and Roseires (Flower, 1933).

Tanzania Common in many parts of Tanzania; apparently not widely exploited for food or skins (K. Howell, *in litt.*, 15 March 1986). Not uncommon on Zanzibar Island (Pakenham, 1983).

Uganda The species is said to be widespread, but particularly abundant in the Bugosa and Buganda areas (Uganda Game Department, *in litt.*, 28 March 1987).

Zambia Good populations occur in Zambia (Broadley, 1971).

Zimbabwe Very common in and around large rivers and lakes (D.G. Broadley, *in litt.*, 18 March 1986).

HABITAT AND ECOLOGY A large diurnal lizard, reaching up to 2 m in length. Found only in association with permanent rivers, streams and lakes, and thus absent from many arid regions. Occupies a variety of holes and crevices as a burrow, usually on abandoned site of some other animal. Excellent swimmers; will dive into water if alarmed. Diet includes a variety of small vertebrates

and eggs (a noted consumer of crocodile eggs), also crabs and mussels and readily scavenges food remains, such as fish guts and chicken bones, from the vicinity of human habitation (Edroma and Ssali, 1983). The female often lays the clutch of 40-60 eggs, ca 58 x 35 mm, in a live termite nest where the termites maintain a thermally stable environment (Cowles, 1930; Branch and Erasmus, 1982)

THREATS TO SURVIVAL Widely used, apparently throughout the continent, for food and skins. In Nigeria, for example, numerous dried lizards can be seen in Ibadan market, and shoes and handbags made from monitor lizard skin can be obtained anywhere in the country (Butler and Shitu, 1985). The skin trade poses a threat to some local populations (D.G. Broadley, *in litt.*, 18 March 1986).

Cameroon Skins are supplied to the commercial trade from the north and extreme north of the country (Cameroon CITES MA, 1987).

Congo *V. niloticus* is expoited for its skin and meat (Congo CITES MA, 1986).

Gabon The people of the coast apparently do not eat monitors, but those of the interior are particularly fond of it, and may have depleted the populations. Internal trade in skins is said to be negligible, and there is not thought to have been any export in 1984 and 1985 (Gabon Ministere des Eaux et Forets, *in litt.*, 29 November 1985).

Kenya Often trapped as vermin around Lake Victoria due to poultry and egg eating, though this seems not to have an adverse effect on the local population (A.D. Mackay, *in litt.*, 26 March 1986).

Mozambique There is said to be some human predation (Mozambique CITES MA, 1986), but its effects have not been assessed.

Namibia The species is not particularly threatened, and there is said to be no commercial exploitation (Namibia Department of Agriculture and Nature Conservation, *in litt.*, 9 March 1987).

Tanzania Not threatened. There is not thought to be much skin trade and few people eat monitors (K. Howell, *in litt.*, 15 March 1986).

Uganda The skins are used by the Bantu tribes to cover their long, cylindrical drums and substantial quantities are thought to be used each year. There are no known authorised exports of live animals and few skins. 50 were exported in 1981, and a shipment of 176 skins bound for Lebanon was intercepted at Entebbe airport in 1986 (Uganda Game Department, *in litt.*, 28 March 1987).

INTERNATIONAL TRADE While relatively small numbers of live animals (mostly from Kenya, Nigeria and Togo) are in reported international trade, between 169 and 1392 from 1980 to 1985, with an annual mean of 816, very large numbers of skins are traded, between 183 830 and 634 639 from 1980 to 1985, with an annual mean of 408 292. Most live animals were destined for the USA, with lesser numbers to F.R. Germany and other parts of Europe.

The skin trade reported to CITES is summarised in Tables 1 and 2. The skins were mostly imported to Europe, especially France, Italy, Switzerland and F.R. Germany. It should be noted that France did not report imports of Appendix II material before 1984, and so the totals in Table 1 from 1980 to 1983 are artificially low. Most of the skin originated in Mali, Nigeria, Sudan and Cameroon.

Table 1 Apparent minimum net imports of skins of *Varanus niloticus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Australia	126	–	340	4917	–	–
Austria	7478	6008	29918	14272	3749	1071
Belgium	735	54	415	5745	30000	–
Canada	79	1609	–	4	2	10
Cyprus	1474	–	–	–	–	–
Denmark	39	60	–	–	–	–
Egypt	–	–	–	–	–	4
Finland	–	–	379	–	–	3
France	–	–	–	–	82653	274829
Germany, F.R.	1592	8478	22595	13440	906	546
Greece	–	132	–	50	–	–
Hong Kong	18	–	1220	103	8	–
Italy	412046	464528	123355	129216	130341	52342
Japan	381	773	–	–	–	30
Kenya	–	–	–	–	–	2
Korea	–	–	–	–	100	–
Kuwait	–	–	–	–	1	–
Lebanon	–	–	20	179	–	–
Macao	–	–	–	–	–	1
Malaysia	–	–	–	–	396	–
Mexico	6000	1379	–	–	–	–
Netherlands	–	10	–	–	–	–
New Zealand	–	–	–	90	–	–
Portugal	–	1033	–	–	–	–
Saudi Arabia	–	–	–	78	8	–
South Africa	–	–	109	120	–	37
Singapore	–	–	–	–	–	8
Spain	2135	–	–	–	–	–
Sweden	–	–	–	–	–	8
Switzerland	88736	–	52630	61359	75144	60870
Togo	–	–	–	–	–	3
Turkey	–	–	–	–	100	72
UAE	9		–	–	–	1
UK	–	–	–	2420	–	53
USA	113791	58522	33553	20117	3678	5124
USSR	–	–	–	–	–	2
Uruguay	–	–	930	200	–	–
Yugoslavia	–	–	–	–	–	204
Country Unknown	–	2	71305	–	–	30000
Total	634639	542588	336390	183830	327086	425216

Table 2 Reported countries of origin (or exporting country if no original source reported) and quantities of transactions in skins of *V. niloticus* reported to CITES.

	1980	1981	1982	1983	1984	1985
a. Countries with populations of *V. niloticus*.						
Africa	12	-	440	-	-	-
Benin	-	-	-	-	-	6950
Cameroon	17515	21175	41505	2400	25508	67276
Chad	7500	111	4574	12214	6008	-
Egypt	-	2182	-	-	-	-
Kenya	-	75	-	-	-	-
Mali	89005	53771	80334	43556	63013	192213
Nigeria	367522	174773	82913	51979	52640	38779
South Africa	5578	3938	1	-	2	1
Sudan	44479	311302	126704	153502	190751	131461
Zimbabwe	-	1	9	170	529	304
b. Countries without populations of *V. niloticus*.						
China	-	-	2185	-	-	-
France	1390	1350	-	-	-	-
Indonesia	1200	-	-	1871	344	3
Italy	967	-	-	-	-	-
Madagascar	2829	-	-	-	-	-
Netherlands	40	-	-	-	-	-
Papua New Guinea	-	-	-	4	-	-
Paraguay	-	-	-	-	900	-
Philippines	-	13270	-	249	995	-
Spain	-	11539	-	-	-	-
Switzerland	1	-	-	200	-	2000
Thailand	-	-	-	4	-	140
UK	-	119	-	-	-	-
Unknown	205500	94970	85885	3565	2131	5390

CONSERVATION MEASURES Unless otherwise stated, all of the information on protection is from IUCN Environmental Policy and Law Occasional Paper No. 3, *African Wildlife Laws*.

Angola Not protected under the Hunting Regulations, 11 December 1955.

Benin Under the Decree concerning hunting and capturing licences, bag limits and professional hunters, 11 February 1980, Varanidae are designated as small game species. They may only be hunted by the holders of traditional hunting rights or under hunting permits.

Botswana The hunting of *Varanus* spp. is controlled under the Fauna Conservation (Unified Hunting) Regulations 12 March 1979, which set out the conditions of issue of hunting licences and the number of animals which may be taken by each hunter.

Varanus niloticus

Burkina *V. exanthematicus* and *V. niloticus* are partially protected under the Wildlife Conservation and Hunting Act, 31 December 1968, which establishes bag limits and close seasons, protects nests and eggs, and regulates the sale of meat. Commercial capture and export are controlled under the same Act by Decree No 68-314. Ordonnance No 68-58, December 1985, fixed the open season from 15 December 1985 to 28 February 1986 and stipulated that partially protected species could only be hunted under special permit and only in the province of Gourma and Tapoa.

Burundi No information.

Cameroon *Varanus niloticus and Varanus griseus* (sic.) are partially protected under the Forests, Wildlife and Fisheries Act, 27 November 1981. They may only be taken under a valid hunting licence. No more than two animals may be taken in one day.

Central African Republic The Ordinance concerning the protection of wildlife and regulating hunting, 27 July 1984, designates *Varanus* as totally protected.

Chad No information.

Congo The Act concerning the conservation and exploitation of wild fauna, 21 April 1983, vests in the State ownership of all wild animals of economic value, and requires the issuing of licences for commercial capturing. A minimum size is set for the taking of *Varanus*, and fees are set for the issuing of certificates of lawful possession or export of monitor lizards. Under a later Order (18 May 1984), *Varanus flavescens* (sic.) is designated partially protected, and may therefore only be taken under a hunting licence.

Djibouti No information.

Egypt All hunting is prohibited in certain regions.

Equatorial Guinea The Hunting Regulations, 29 April 1953, establish the need to obtain hunting licences except for subsistence hunters. Reptiles are not protected.

Ethiopia Under the Wildlife Conservation (Amendment) Regulations, 12 February 1974, *Varanus niloticus* is protected. They may only be hunted for scientific purposes and require a special permit, the value of which was set at Eth$1.00 for each *Varanus*.

Gabon The Wildlife and Forests Act, 22 July 1982 requires the issuing of licences for the commercial capture of all wildlife. Traditional hunting for subsistence pruposes is permitted.

Gambia Under the Wildlife Conservation Act, 14 February 1977, all wildlife except game and vermin are protected.

Ghana The Wildlife Conservation Regulations, 4 March 1971, define *Varanus niloticus* as totally protected.

Guinea No information.

Guinea-Bissau The Hunting Regulations, 12 May 1980, require the issuance of a licence for the capturing of live wild animals.

Ivory Coast *Varanus niloticus*, *V. exanthematicus* is listed as predatory animals in the Wildlife and Hunting Act, 4 August 1965, and may be hunted without licence anywhere except in protected areas. Arrêté No. 15, 26 December 1972, establishes licence fees for the capturing of live reptiles. Under the Order regulating the commercial hunting of crocodiles and monitor lizards, 29 September 1967, a special permit is required to capture monitor lizards for commercial purposes. The possession of specimens having a skin width of less than 25 cm is prohibited.

Kenya Protected by legislation in Kenya, export being banned (Legal Notice No. 152, 25 September 1981).

Lesotho *Varanus* spp. are totally protected under the Proclamation of Monuments, Relics, Fauna and Flora, 1969.

Liberia The Wildlife Conservation Regulation (in draft, 1985) lists *V. niloticus* as partially protected, thereby providing for closed seasons. Trade in and export of fully and partially protected species is prohibited except for educational or scientific purposes.

Malawi Hunting, possession, trade and export of game is controlled under the Game Act, 1953. No reptiles, other than crocodiles, are protected.

Mali All *Varanus* species are classified as game species under the Hunting Act, 11 November 1969. There is a general close season from 1 June to 31 October. A general hunting ban (Decree 325/PG-RM) throughout the country was imposed on 6 November 1978.

Mauritania Under the Hunting and Wildlife Protection Act, 15 January 1975, the capture, possession, sale and export of live wild animals requires a commercial capture permit. The sale of game meat is prohibited.

Mozambique *V. exanthematicus* is fully protected by national legislation. It occurs in Gorongosa National Park (Mozambique CITES MA, 1986).

Namibia Protected by the Nature Conservation Ordinance (Namibia Department of Agriculture and Nature Conservation, *in litt.*, 3 March 1987).

Niger All hunting for utilitarian purposes has been prohibited in Niger since 1972 (Niger CITES MA, 1986).

Nigeria *V. niloticus*, and *V. exanthematicus* are listed as fully protected in the Endangered Species (control of International Trade and Traffic) Decree, 20 April 1985. Their hunting, capture, trade and export is prohibited. On 28 May 1982, the CITES Secretariat sent a notification (No. 218) to all Parties requesting them not to accept imports from Nigeria as the Nigerian Management Authority did not issue any export permits.

Rwanda *Varanus niloticus* is partially protected under the Hunting Regulations, 31 December 1974. A licence is required for hunting and close seasons may be set.

Sao Tomé and Principe No information.

Senegal The Game and Wildlife Protection Regulations, 30 May 1967, lay down regulations governing the issuance of licences for hunting and commercial capturing of wildlife.

Sierra Leone All *Varanus* are listed as prohibited animals in the Wildlife Conservation Act, No. 27, 1972. It is illegal to hunt or possess them.

Somalia *Varanus* are listed as game animals under the Law on Fauna (Hunting) and Forest, 25 January 1969. They may only be hunted or exported under licence. A ban on all hunting was instituted on 13 October 1977.

South Africa *V. niloticus* is partially protected in the Transvaal and may not be captured or kept except under permit. They are protected by ordinance in the Cape Province and occur in at least 58 of the 60 protected areas in Natal (South Africa CITES MA, 1987).

Sudan *V. exanthematicus* and *V. niloticus* are listed in the Ordinance for the Preservation of Wild Animals, 1935 (Amended 1974), as species for which hunting is permitted. Licences are only required if firearms are used for hunting. The Hides and Skins (Export) Regulations, 1969, specify a grading system for the export of reptile skins.

Swaziland Apparently no reptiles are protected in Swaziland.

Tanzania Under the Wildlife Conservation Act, 30 June 1974, the capture of all live animals requires a valid capture permit, and the hunting of all animals requires a valid hunting permit.

Togo *V. exanthematicus* and *V. niloticus* are classified as pest species under the Ordinance on Wildlife Protection and Hunting, 16 January 1968. An enabling decree, dated 4 June 1980, sets out licence fees for hunting and commercial capture, but there is no bag limit for these species.

Uganda No reptiles, other than crocodiles, are protected.

Zaire The commercial capture of unprotected animals requires a permit under the Hunting Act, 28 May 1982. Export can only be authorised if the exporter holds a certificate of lawful possession.

Zambia *V. exanthematicus* and *V. niloticus* are listed as game animals in the National Parks and Wildlife Act, 3 December 1968, under which their hunting, possession, trade and export are controlled and fees are set for the export of trophies and live animals.

Zimbabwe The collection of live reptiles and their eggs and their breeding in captivity are controlled under licence by the Parks and Wildlife (General) Regulations, 1981.

CAPTIVE BREEDING A recent inventory lists 15 specimens in 9 collections, but lists no captive breeding (Slavens, 1985). Breeding took place in the Transvaal Snake Park in 1986, 33 being produced from a single clutch (South Africa CITES MA, 1987).

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WATER MONITOR

Recommended list: 2
[Possible problem]

Varanus salvator (Laurenti, 1768)

Order SAURIA

Family VARANIDAE

SUMMARY AND CONCLUSIONS A potentially very large monitor lizard, widespread in South and Southeast Asia, from Sri Lanka east to southern China and the Philippines, and south through mainland Southeast Asia to Indonesia. Typically associated with water and thus frequently found alongside forest waterways but also occurs in rice fields and coastal mangroves. Eggs, 6 to 30 in number, are often laid in live termite mounds. In the early twentieth century generally said to be common or very common; although now reportedly depleted or extirpated locally, the species appears to remain relatively common over much of its range. Populations are affected by habitat loss, although utilisation appears to be a more important factor.

Lizards and eggs are widely, but not universally, utilised for food and medicinal purposes. Moderate numbers of live animals (around 1000-4500 annually from 1980 to 1985) are in international trade, but very large numbers of skins are traded, with over a million in 1985.

Field information on population status and trends is required to help assess the long-term sustainability of the present high trade levels.

DISTRIBUTION A widespread south and South East Asian species, ranging from Sri Lanka and parts of India, eastward to southern China and the Philippines, and south-east through the Malay Peninsula to Indonesia. Present in the following countries, with details of distribution in each, if available.

Bangladesh Occurs in the Sunderbans and extends east and south to the border with Burma, near St. Martin's Island (Khan, 1982).

Brunei Presumed present, no records located.

Burma Present, at least formerly, in suitable sites throughout the country (Smith, 1930).

China Present in the south only, in Yunnan, Kwangtung, Kwangshi and Hainan (Anon., 1977).

Hong Kong Despite being present in southern China, the Water Monitor was apparently unknown in Hong Kong until four specimens were reported at different times in 1961 (Romer, 1963); no further sightings have been reported since, and the species probably no longer occurs there (UK (Hong Kong) CITES MA, 1987).

India Restricted in distribution. Absent from the peninsula except for the 200 sq. km Bhitarkanika Wildlife Sanctuary (an island in the Mahanadi-Baitarani delta) in Orissa, and coastal parts of West Bengal (Sunderbans), also recorded (Smith, 1935) in extreme north-east India up to 6000 ft (1800 m). Present in the Andaman and Nicobar Islands (Biswas & Kar, 1981; Whitaker and Whitaker, 1980).

Indonesia Widespread, including Sumatra, Java, Kalimantan, with adjacent smaller islands; seemingly more sporadic in the east, but extends to Sulawesi, Halmahera and Obi, and also Bali, Lombok, Sumbawa and Flores (Mertens, 1963).

Kampuchea No data.

Laos Occurs along the Mekong River valley, which extends the length of the country in the west (Laos Wildlife Conservation and Fishery Office, *in litt.*, 31 January 1986).

Malaysia Few details available; in Sabah reportedly widespread at lower altitudes wherever water is available (Malaysia (Sabah) CITES MA, 1985), also widespread in Peninsular Malaysia (G. Davison, *in litt.*, 22 February 1986) and in Sarawak (H. Watson, *in litt.*, 17 March 1986).

Philippines Widespread, including the larger islands of Luzon and Mindanao, also Leyte, Cebu, possibly Samar, and probably numerous smaller islands (Mertens, 1963).

Singapore Has been recorded (Ridley, 1899), no details available.

Sri Lanka Widespread, although seemingly absent from the east and south-east coastal areas (Whitaker and Whitaker, 1980).

Thailand Occurs throughout the country, typically along rivers and streams (Taylor, 1963; Lekagul, 1969).

Viet Nam No data.

POPULATION Despite, or perhaps because of, the wide distribution and sometime abundance of this species there is virtually no detailed population information presently available (W. Auffenberg has results of fieldwork in preparation). The sole exception relates to Flores (Lesser Sundas, Indonesia) where Auffenberg (1981; 1982) has recorded an estimated 15 individuals per km of river bank (the Nanga Loök), and 8 per km of coastal mangrove (see below for note on habitat tolerance). Population density can thus be rather high locally. Older literature sources typically remark on the wide distribution and abundance of the Water Monitor, eg. "very numerous in suitable localities throughout the Malay Peninsula and Siam" (Flower, 1896). However, although the present situation seems to be unknown in detail, the species is now reportedly reduced in density, or extirpated, in many places where it was common in the early 1970s (Auffenberg, 1982; *in litt.*, 1 March 1984). Comments on general status, often anecdotal in nature, are given below where available.

Bangladesh Common (Khan, 1982); common in coastal districts (Bangladesh CITES MA, 1986).

Burma A 1930 source (Smith) states that the species is "quite plentiful" in Burma in suitable localities. Often encountered on islands of the Mergui Archipelago, also reported particularly plentiful around Mandalay where the lizards live in canals and irrigation channels. Lizards of 1.8 m (6 ft) or more in length were "frequently seen dashing across the Mandalay-Maymyo main road in front of motors" (Smith, 1930). No recent data on status are available (Salter, 1983).

China Reported rare in e 1922 source (Mell, cited by Smith, 1935), and said to be apparently rare (Romer, 1963); no recent data available.

Hong Kong Probably no longer occurs in Hong Kong (UK (Hong Kong) CITES MA, 1987).

India Uncommon within Bhitarkanika, where the population is restricted to the Wildlife Sanctury. Said to be reduced to remnants of former abundance in the Sunderbans (Whitaker and Whitaker, 1980). Fairly common before WW II in the Garo Hills of Assam (Parry, 1935). Population levels in the Andamans and

Nicobars seem to be good away from human settlements, and in the Jarawa Tribal Reserve, parts of Little Andaman and the southern islands of the Nicobar group are "still intact and close to original in composition" (Whitaker and Whitaker, 1980). Officially considered severely depleted and given Endangered status (Tikader, 1983).

Indonesia Cited as very common by a 1915 source (De Rooij); no recent data other than Auffenberg's, cited above.

Kampuchea Said to be common in the early twentieth century (Smith, 1935), no recent data.

Laos Believed to be declining due to habitat loss and exploitation for food (Laos Wildlife Conservation and Fishery Office, *in litt.*, 31 January 1986).

Malaysia Said to be still quite common and readily seen (B.H. Kiew, *in litt.*, 25 February 1986) in Peninsular Malaysia, or still very common but declining rapidly (S. Ambu, *in litt.*, 17 February 1986). However, although the species is not unusually seen along larger rivers here, assessing its abundance is difficult, one factor being to distinguish *salvator* from other Malaysian *Varanus* (G. Davison, *in litt.*, 22 February 1986). The call (Khan, 1969) for improved management and legislation implies that exploitation has adversely affected population levels.

Said to be abundant in suitable habitat (which is very widespread) in Sabah (Malaysia (Sabah) CITES MA, 1985) and widespread and common in Sarawak, even in areas with high human populations, such as the suburbs of Kuching (H. Watson, *in litt.*, 17 March 1986). However, also reportedly seen infrequently in primary rainforest in Sarawak, where during 654 days of herpetological sampling at three sites, a total of only six *salvator* were recorded (R.F. Inger, *in litt.*, 5 March 1986).

Philippines No information.

Singapore No information.

Sri Lanka Apparently still a stronghold for the species in South Asia; Water Monitors are abundant and commonly seen scavenging in village rubbish or swimming in streams despite the presence of people washing clothes or bathing (Whitaker and Whitaker, 1980). This is attributed to the fact that the species is little persecuted or exploited in the country.

Thailand Reportedly common along rivers and streams, also often encountered in deep forest far from water (Lekagul, 1969). Seen fairly often in Khao Yai National Park; perhaps not markedly threatened in Thailand (W.Y. Brockelman, *in litt.*, 14 February 1986).

Viet Nam Said at one time to be common in extreme south Viet Nam ('Cochin China') (Smith, 1935). No recent data.

HABITAT AND ECOLOGY A large diurnal, carnivorous, terrestrial-aquatic monitor lizard, capable of attaining about 2.5 m total length. In Burma, most frequently seen near streams in remote evergreen forests, including on islands (Smith, 1930). Here, and apparently throughout the range, the presence of permanent surface water is the primary factor determining the occurrence of *V. salvator* (Auffenberg, 1981; 1982). For example, the banks of the river Nanga Loök (Flores, Lesser Sundas) bear coastal mangrove swamp, dense gallery forest, savanna, and agricultural land, at various points along its course, but the species ranges through all riverine habitats regardless of vegetation structure, and also occurs in areas of rice cultivation away from the river.

Individuals rarely move away from water and are most frequently observed swimming in the river, basking on its banks, or foraging along a narrow linear strip parallel to the river, its width dependent on the adjacent vegetation (up to 50 m in dense forest but only a few metres in open areas). However, the lizards may move 0.5 km or more inland in the monsoons (Auffenberg, 1981) and Smith (1930) records a large female being found in a new rain pool in a remote and very dry forest area of Burma. The core areas of each adult's active range are typically 500 m apart (Auffenberg, 1981).

Feeding is largely opportunistic. The diet is varied, larger individuals tend to take larger prey. Food items include crabs, fishes, frogs, birds, small mammals, eggs and all manner of carrion, also domestic chickens.

In monsoon areas, nesting coincides with the start of the rains, in June in India (Whitaker and Khan, 1982) and Thailand (Smith, 1935) for example. In India at least, nest sites are located above the high watermark and often in live termite mounds (Whitaker and Khan; Biswas and Kar, 1982); elsewhere (Burma; Smith, 1930) nest sites are reported in holes in trees near or overlying water. Eggs are about 40 x 70 mm; around 15-30 (Smith, 1935) or 6-20 (Biswas and Kar, 1981) in a clutch. Hatchlings from eggs laid in June emerge in March-April, after about 260 days incubation, and are around 30-32 cm in length. In one captive breeding group, both sexes were 1.4-1.5 m in length.

THREATS TO SURVIVAL Widely exploited for skins, meat and fat (for medicinal purposes); semi-developed eggs in gravid females are considered a delicacy and body fat is either consumed, to improve general vigour, or applied, for muscle and joint pains (Whitaker and Whitaker, 1980).

India In India, also affected by loss of mangrove habitat to farming, and by timber and firewood extraction; these are likely to be significant in other parts of the range although no details are available. Hunting with dogs is a particular threat in the Andamans and Nicobars; 30 monitors were seen to be collected this way in one month (Whitaker and Whitaker, 1980).

Laos Adversely affected by habitat loss and disturbance, also exploited for food, in Laos (Laos Wildlife Conservation and Fishery Office, *in litt.*, 31 January 1986).

Malaysia Said to be little exploited in Sabah, and not exported (Malaysia (Sabah) CITES MA, 1985). In Sarawak, hunting of this species is generally for personal food use, not for the commercial skin trade (H. Watson, *in litt.*, 17 March 1986). Said to be only moderately exploited, for food and leather, in West Malaysia (B.H. Kiew, *in litt.*, 25 February 1986).

Philippines A permit for the hunting of 19 796 head of *V. salvator* was granted retrospectively in 1981 to allow the sale of stockpiled skins (Philippines CITES MA, 1981).

Sri Lanka Water Monitor flesh is believed poisonous in Sri Lanka and this seems to be one reason why it is little persecuted.

INTERNATIONAL TRADE CITES Annual Reports show that there is a substantial international trade in the skins of *V. salvator*, varying from 256 683 in 1980 to 1 152 532 in 1985 (Table 1). The main importing countries have been the USA, France, Italy, Austria and Japan. Until 1984, France did not report the imports of Appendix II species, and so it is possible that the totals for earlier years are artificially low. The reported source countries (Table 2) were Indonesia, Thailand, Malaysia, the Philippines and Singapore. As the latter country is not thought to have a substantial wild population of

Table 1 Minimum net imports of skins of *V. salvator* reported to CITES. The few transactions reported in terms of weight, length or area are not listed.

	1980	1981	1982	1983	1984	1985
Argentina	-	250	-	-	-	-
Austria	1589	-	9849	18832	53322	72533
Australia	3159	-	16	2124	-	-
Belgium	-	-	1181	-	-	-
Brazil	-	-	-	-	-	32921
Canada	13651	1783	1004	14604	37617	108979
Denmark	654	17931	92	-	171	-
Egypt	-	-	1176	-	-	-
Finland	-	-	151	-	-	-
France	-	-	-	-	188472	285685
Gambia	-	-	-	-	8125	-
Germany, F.R.	3864	-	19480	14857	17649	16606
Greece	-	-	40	-	-	213
Hong Kong	17279	-	22133	31733	33675	26211
Hungary	-	-	-	200	-	-
Ireland	-	-	2	-	-	-
Italy	9203	37958	75344	71863	133349	121659
Japan	85438	-	-	-	-	340411
Korea, S.	-	-	-	9607	29172	21797
Lebanon	70	-	-	-	-	-
Mexico	-	-	-	-	-	177
Netherlands	-	5058	-	-	362	1224
New Zealand	-	-	82	43	83	-
Norway	20	-	-	-	-	-
Panama	1	-	-	-	-	-
Singapore	-	-	-	203934	-	-
South Africa	108	10	-	112	-	-
Spain	-	-	-	726	10056	-
Sweden	141	-	160	-	55	-
Switzerland	6750	-	6372	10222	8604	27329
Turkey	-	-	20	83	300	1036
Taiwan	-	-	-	-	-	2696
UK	22820	-	8782	-	-	23395
USA	107436	689668	71077	118954	167069	67467
Yugoslavia	-	-	-	-	-	193
Unknown	-	17796	33	1	1	2000
Total	256683	770454	216994	497895	610118	1152532

V. salvator, it is likely that the skins reported to have originated there were re-exports, probably deriving in Indonesia or other neighbouring countries. Up to half of the skins in trade in some years were reported to have come from unknown sources.

There was also a smaller reported trade in live *V. salvator*. Minimum net trade amounted to 2283 in 1980, 1238 in 1981, 321 in 1982, 1694 in 1983, 4577 in 1983 and 4686 in 1985. These numbers, although large, are probably insignificant in terms of the species's survival. However, it seems that at least local populations are likely to be adversely affected by the extensive international trade in skins. Instances of local decline and extirpation are reported by Auffenberg (1982; *in litt.*, 1 March 1984), although no details

are available. This suggests that present trade volumes may be excessive, and reinforces the need for quantitative information on population status and trends, currently lacking.

Table 2 Reported countries of origin (or exporting country if no original source reported) and quantities of transactions in *Varanus salvator* reported to CITES.

	1980	1981	1982	1983	1984	1985
a. Countries having or possibly having wild populations of *V. salvator*						
Bangladesh	–	–	20	2502	8225	525
Brunei	–	1000	–	–	–	–
China	–	40000	600	–	–	–
India	148	6200	–	1001	847	17 kg
Indonesia	81051	148895	147228	360841	404490	626036
Malaysia	1071	17816	–	30348	25863	1391
Philippines	330	33653	22904	4478	3634	82870
Singapore	73707	247453	69825	43728	14420	307644
Thailand	54552	115988	20629	34550	210582	214074
Viet Nam	–	–	–	15	–	–
'Asia'	7548	3400	–	10	–	–
b. Countries without wild populations of *V. salvator*						
Australia	–	2454	–	–	–	–
Canada	4	3	4	–	–	–
Colombia	–	–	–	1000	–	–
France	54	–	–	–	–	–
Germany, F.R.	3401	–	–	–	–	–
Japan	1298	43910	600	8736	48	51758
Netherlands	4000	–	–	–	–	–
Nigeria	3	–	–	–	100	111
Paraguay	–	250	–	–	–	–
Spain	–	–	–	–	–	1
Sudan	974	–	–	3600	24	–
Switzerland	–	–	–	24	–	–
Taiwan	–	17885	570	–	–	–
UK	794	9415	–	30	–	–
USA	677	–	1	421	178	431
Unknown	166349	151097	92471	110985	113078	920

CONSERVATION MEASURES

Bangladesh Nominally protected by legislation (Bangladesh CITES MA, 1986).

Hong Kong Protected under Hong Kong legislation (UK (Hong Kong) CITES MA, 1987).

India Nominally protected by legislation in India (Schedule I of the Wildlife Protection Act).

Indonesia Hunting quotas for *V. salvator* have been set for 1987 totalling 350 000 animals, divided between the different regions as follows: Aceh

(65 000), Riau (30 000), Sumut (16 000), Sumbar (17 000), Bengkulu (8500), Jambi (8000), Sumsel (20 000), Lampung (5000), Jabar (9000), Kalbar (17 500), DKI (18 000), Jateng (500), Jatim (600), Kalsel (36 400), Kalteng (20 000), Kaltim (40 000), Sulsel (10 000), Sulteng (1000), Sultra (2500), Sulut (-), NTT (1000), NTB (12 000), Timtim (1000), Maluku (1000), Irja (10 000) (Indonesia CITES MA, 1987).

Malaysia In Peninsular Malaysia a law prohibits trapping of lizards up to and including 16 inches length (S. Ambu, *in litt.*, 17 February 1986); also listed on the 1972 Wildlife Protection Act, however, trading licenses are readily obtainable (B.H. Kiew, *in litt.*, 25 February 1986).

Philippines Permits for the export of *V. salvator* were granted retrospectively to allow the sale of stockpiled skins. These totalled 1400 in 1983, 4020 in 1984 and 248 in 1985 (Philippines CITES MA, 1981). They are very substantially less than the number of skins which appear from CITES Annual Reports to have originated in the Philippines (Table 2).

Singapore All wild fauna in Singapore are protected by legislation (Singapore, Primary Production Department, *in litt.*, 11 January, 1986).

CAPTIVE BREEDING A recent inventory (Slavens, 1985) reports 47 individuals in 26 collections in 1984, with breeding in two.

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BOA CONSTRICTOR

Recommended list: 2
[Possible problem]

Boa constrictor (Linnaeus, 1758)

Order SERPENTES

Family BOIDAE

SUMMARY AND CONCLUSIONS Widely distributed from Central America to Argentina. Largely arboreal, but found in a variety of habitats, from moist forests to arid scrubland. The largest subspecies, *B. constrictor constrictor*, grows to up to 5.6 m long. It is chiefly nocturnal, and feeds mainly on small vertebrates. Brood sizes are usually between 30 and 50. There is little information on population levels, but what there is may be conflicting. In some areas it is said to be seriously depleted, and in others, abundant. It is locally encouraged and protected to control rodent pests.

CITES Annual Reports show that from 1980 to 1983 most of the trade in the species was in skins, possibly up to 100 000 a year, but that this dropped considerably in 1984 and 1985. There is also a demand for pets, and trade in live animals declined from 20 000 in 1980 to 1830 in 1983 but increased to 18 418 in 1985, thereby accounting for more snakes than the skin trade. The major suppliers of live animals are in Central America, particularly El Salvador; Paraguay, Argentina and Panama supplied most of the skins.

Insufficient data are available to set sustainable harvest levels; but it seems likely that the current levels are not excessive on a global scale, although they may be locally. The major threat is from the skin trade, partially because of the higher numbers which were formerly involved, and partially because it is liable to use older animals than the pet trade, but the apparently increasing trade in live animals should be closely monitored. The species is protected in all of the major countries that supply skins, and imports from these countries should not be permitted. This requirement is clearly being ignored. The major importing countries are the USA, France and Italy. In 1987, *B. c. occidentalis* was transferred to Appendix I of CITES.

DISTRIBUTION Widespread in Central and South America from Mexico to northern Argentina, including selected Caribbean islands. The species has been split into several subspecies, which are morphologically distinct.

Boa constrictor imperator Daudin 1803:

Belize Present (Groombridge, 1983).

Colombia West of the Andes on the mainland (Peters and Orejas-Miranda, 1970), and including the islands of Providencia, San Andrés, Santa Catalina (Schwartz and Thomas, 1975), Uraba and Gorgona. It is thought to have been introduced to the islands of Providencia and San Andrés to control rodent pests in the plantations around 1930 (Gallego, 1978). The few records from Isla Gorgona are thought to indicate sporadic passive migration, and that there is no established breeding population (Medem, 1979).

Costa Rica The highest altitude record for the country was said to be 914 m (Pope, 1962).

Ecuador West of the Andes (Peters and Orejas-Miranda, 1970; Miyata, 1982). A new subspecies, *B. constrictor melanogaster*, has recently been described from Ecuador (Langhammer, 1983).

El Salvador The highest altitude record for the country was said to be 650 m (Pope, 1962).

Guatemala Present (Groombridge, 1983).

Honduras Recorded from scattered locations throughout the mainland and including Las Islas de la Bahia (Wilson and Meyer, 1982).

Mexico Recorded from the states of Baja California, Campeche, Chiapas, Colima, Durango, Guerrero, Jalisco, Michoacan, Morelos, Nayarit, Oaxaca, Puebla, Queretaro, Quintana Roo, San Luis Potosi, Sinaloa, Sonora, Tabasco, Tamaulipas, Veracruz, Yucatan and Zacatecas (Smith and Smith, 1976). The most northerly record is in Sonora, only 120 km from the Arizona border. There are occasional, unverified reports from Arizona, but these are thought to represent escapes (Baltosser, 1982). The highest altitude record for Mexico was said to be 792 m (Pope, 1962).

Nicaragua Present (Groombridge, 1983).

Panama *B. constrictor imperator* occurs on the mainland in mountainous areas, chiefly in the provinces of Chiriqui, Bocas del Toro, Panama and Darien (Panama CITES MA, 1985). A seperate subspecies, *B. constrictor sabogae*, is said to be confined to Taboga Island (Peters and Orejas-Miranda, 1970).

Peru West of the Andes (Peters and Orejas-Miranda, 1970); a seperate subspecies, *B. constrictor ortoni*, is said to be confined to a region in the North-West (Peters and Orejas-Miranda, 1970).

Boa constrictor constrictor Linnaeus, 1758:

Argentina Moist forests in the North (Freiberg, 1982).

Bolivia Widespread in the Amazonian region (Hoogmoed, 1979).

Brazil Widespread in the Amazonian region (Hoogmoed, 1979), and northern forests, but absent from the Atlantic forests (Dixon, 1979).

Colombia East of the Andes (Peters and Orejas-Miranda, 1970), widespread in the Amazonian region (Hoogmoed, 1979).

Ecuador East of the Andes (Peters and Orejas-Miranda, 1970; Miyata, 1982), widespread in the Amazonian region (Hoogmoed, 1979).

French Guiana Widespread (Gasc and Rodrigues, 1980).

Guyana Present (Hoogmoed, 1982b).

Paraguay Found in moist forests (Freiberg, 1982).

Peru East of the Andes (Peters and Orejas-Miranda, 1970), widespread in the Amazonian region (Hoogmoed, 1979). Recorded from Iquitos, Moropon, Mishana and Pebas (Dixon and Soini, 1986).

Suriname Present (Hoogmoed, 1982b).

Trinidad and Tobago Recorded from Trinidad, where it is widely distributed (Emsley, 1977), and Tobago (Emsley, 1977; Hardy, 1982).

Venezuela Widespread throughout most of the country below 1000 m (Roze, 1966).

Boa constrictor

Boa constrictor amarali Stull, 1932:

Brazil South and south-west regions (Freiberg, 1982).

Bolivia Said to occur in south-east regions (Freiberg, 1982), although this is given as the possible range of *B. c. occidentalis* (Anon., 1987).

Boa constrictor occidentalis Philippi, 1873:

Argentina Arid sub-tropical forests in the north and west (Freiberg, 1982; Peters and Orejas-Miranda, 1970), in Salta, Jujuy, Chaco, Formosa, Catamarca, La Rioja, Tucuman, Santiago del Estero, Cordoba, Santa Fe, San Luis, San Juan, Mendoza and La Pampa, possibly occuring in the west of Buenos Aires (Gallardo, 1977; Anon., 1987). The area of distribution is said to be declining (Argentina CITES MA, 1987).

Bolivia This subspecies may occur in the extreme south-east adjacent to the Argentinian and Paraguayan borders, but there is no accurate information (Anon., 1987).

Paraguay Arid sub-tropical forests (Freiberg, 1982; Peters and Orejas-Miranda, 1970) in the western part of the country (Anon., 1987).

Uruguay A map given by Hoogmoed (1982b) includes Uruguay in the range of *B. constrictor*, but this must be considered to be erroneous.

Boa constrictor ortoni Cope, 1878:

Peru Confined to a region in the north-west (Peters and Orejas-Miranda, 1970).

Boa constrictor orophias Linaeus, 1758:

St Lucia Widespread on the main island, but absent from the Maria Islands (Lazell, 1964; Schwartz and Thomas, 1975; Corke, 1983).

Boa constrictor nebulosa (Lazell, 1964):

Dominica Present (Schwartz and Thomas, 1975); widely distributed, observed at La Chaudière and River Canari (reported as *B. constrictor orophias* by Swank and Julien, 1975).

Boa constrictor sabogae:

Panama Confined to Taboga Island (Peters and Orejas-Miranda, 1970).

POPULATION

Argentina The species is said to have become restricted in distribution (Gallardo, 1977) and to have declined in numbers alarmingly in the country (Tarak, A., *in litt.*, 1 June 1981). The status in the provinces has been summarised as follows: Cordoba, scarce; Tucuman, potentially endangered; Mendoza, virtually extinct although formerly abundant; San Juan, major population reduction; La Pampa, extremely rare; San Luis, threatened and declining; Salta, declining and in need of protection; Catamarca, considerably

reduced from former abundance owing to hunting; La Rioja, vulnerable; Chaco, Formosa and Santiago del Estero, relatively common in the extensive forests (Anon., 1987). *B. constrictor occidentalis* was said to be already extinct in the Reserva Ecologica Nacunan in Mendoza (Abraham de Vazquez and Wuilloud, undated).

Belize No information.

Bolivia No information.

Brazil Said to be extremly common, especially around towns (W.E. Magnusson, pers. comm., 1986).

Colombia No information.

Costa Rica No information.

Dominica Said to be common and widely distributed in 1975 (Swank and Julien, 1975)

Ecuador No information.

El Salvador Included in the list of species "threatened with extinction" in 1978, and said to be in need of a 10-year ban on hunting to aid recovery (Serrano, 1978).

French Guiana Said to be widespread (Gasc and Rodrigues, 1980).

Guatemala No information.

Guyana No information.

Honduras The population size is unknown, but it is thought to be very rare (Aguilar, W., *in litt.* 29 November 1985). Distribution records indicate that it is widespread within the country (Wilson and Meyer, 1982).

Panama Moderately common in mountainous areas (Panama CITES MA, 1985).

Paraguay There is no information for the whole country, but *B. constrictor* was said to be abundant in 1978 in the Parque Nacional Defensores del Chaco (Torres Santibanez, 1978).

Peru Described as common in the Iquitos Rgion (Dixon and Soini, 1986). *B. constrictor* is listed as a "vulnerable species" in Peruvian legislation (Fuller and Swift, 1985).

St Lucia Probably widespread, but present status unknown, thought to be vulnerable (Corke, 1983).

Suriname Said to occur in reasonable numbers (Hoogmoed, 1982a).

Trinidad and Tobago Widely distributed (Emsley, 1977).

Venezuela Populations are said to have decreased (Venezuela CITES MA, 1987), although Gorzula (*in litt.*, 11 April 1986) considered that they could still be categorised as frequent.

HABITAT AND ECOLOGY A medium or large boid snake, *B. constrictor* commonly grows to a length of 2-3 m (Freiberg, 1982), although may exceptionally reach 5.6 m (Stidworthy, 1969). Females generally grow larger than males (Stafford,

1979). *B. constrictor constrictor* is the largest subspecies, while *B. constrictor amarali* is usually little over 1 m in length (Freiberg, 1982). *B. constrictor occidentalis* seldom exceeds 2.2 m (Gallardo, 1977).

It is largely arboreal, commonly found in moist forests, along water-courses and in coastal regions, although it is rarely seen in water. It may also live in arid areas. It is chiefly nocturnal, taking refuge during the day in hollow trees, crevices in rocks or under roots, or the burrows of mammals, especially those of vizcachas in Argentina (Pope, 1962; Emsley, 1977; Flores Villela, 1980; Freiberg, 1982).

The colouring is very variable: *B. constrictor imperator* is largely dark, with obscure cross-bars, while *B. constrictor constrictor*, the Red-tailed Boa, has handsome reddish markings, particularly on the tail (Breen, 1974).

The growth rate is not known, although the greatest longevity recorded in captivity was 40 years, 3 months (Engelmann and Obst, 1984). Pope (1962) presents data on the growth in captivity of several individuals. The fastest incremant in length was a female which grew from 51 cm to 269 cm in two years. Another animal, 157 cm long, only grew to 165 cm in a little over a year. The relationship between weight and length is exhibited by a snake which weighed 348 g at a length of 91 cm, 747 g at 119 cm, and 1992 g at 180 cm (Pope, 1962).

B. constrictor kills its prey by constriction. It feeds chiefly on small mammals, especially rodents, agoutis, pacas, squirrels, bats and monkeys, but it may also take birds and other reptiles, such as iguanas, tegus and other snakes. Occasionally larger prey, such as ocelot, or even porcupine may be taken (Emsley, 1977; Flores Villela, 1980). It is particularly useful in agricultural regions in keeping rodent pests under control (Pope, 1962; Mena Moya, 1978). Pope (1962) gives some data on the amount of food eaten by boas in captivity: one young animal ate 104 mice, 22 hamsters, 5 guinea pigs and 5 sparrows over a 26-month period. The passage time can be as little as 7-9 days, but digestion can take longer, depending on temperature (Engelmann and Obst, 1984).

Like all New World boids, it is ovoviviparous, commonly having broods of 30-50, the young emerging at a length of around 50 cm (Freiberg, 1982). The largest brood recorded was 63 (Emsley, 1977). A brood of 59 *B. constrictor constrictor*, in a private collection, averaged 14 inches (36 cm) in length (Slavens, 1985).

The age at maturity in the wild is not known, but a captive animal started sexual activity at an age of three years (Pope, 1962).

The gestation period is said to be 119-295 days (Engelmann and Obst, 1984). A pair was seen copulating during the month of April in Mexico (Flores Villela, 1980), and in captivity it is usual for broods to emerge in May (Breen, 1974). In Trinidad it is usual for copulation to occur in the dry season (January to May), the young being released from May to September (Emsley, 1977). A pair in a private collection were observed copulating six times between 15 February and June 1985, the young being born on 7 August 1985 (Slavens, 1985).

THREATS TO SURVIVAL *B. constrictor* is hunted chiefly for its skin, although its flesh is apparently good, and there are reports of its having been used as food by pre-Columbian peoples (Flores Villela, 1980), although Pope (1962) considers that the consumption of snakes was not widespread in South America. More recently, a Belgian restaurant is reported to have featured Boa Constrictor on its menu (Chapman, 1982). Live animals are extensively traded as pets. The pet trade relies primarily on young animals,

and differs in this respect from the skin trade, for which larger animals are preferred. It is therefore likely to have less impact on exploited populations. A pet supplier in the USA (South American Unlimited, New York) listed "Guyana Redtail Boas" at US$100 each on its price list in 1985. There is very little detailed information regarding exploitation.

Argentina Hunting for skins is thought to have caused a severe reduction in the population of *B. constrictor* in the country (Tarak, A., *in litt.*, 1 June 1981). Habitat destruction is also implicated in some areas, particularly Tucuman, East Chaco and Formosa, where the preferred habitat of chaquena forest has been destroyed. Vizcacha are sometimes eradicated in their burrows by burning or toxic gas, and this has a catastrophic effect on the Boas, which regularly use the burrows. There is some hunting for meat and for the fat which is supposed to have medicinal properties, but both are of minor significance compared with the hunting for skins. The main domestic market was in Buenos Aires, but internal trade was made illegal in 1986 (Anon., 1987).

Brazil In July 1984, IBDF (Instituto Brasileiro de Desenvolvimento Florestal) seized a shipment of 140 tanned snake skins (*B. constrictor* and *Eunectes murinus*) in Porto Alegre. The skins were en route from Belem to Sao Leopoldo and were thought to be destined for export once they had been manufactured into shoes and other products (J.T. Palazzo, *in litt.*, 1984).

Wettenberg *et al.* (1976) conducted a survey of restaurants in Manaus to find out which species of wildlife would be preferred as food by the public. At the time of the survey none of the restaurants had any wildlife on their menus, as sales of wildlife products were illegal. "Giboia" (*Boa constrictor*) was mentioned by only one restaurant.

Panama Trade in wildlife in Panama has been giving cause for concern since at least 1978, when "small boas" were amongst the species being traded. At that time there were ten companies involved in the import, export and re-export of wildlife products. Legislation did not control the shipment of goods in transit through Panama, and companies were said to import animals from overseas without adequate documentation, and then to re-export them. Occasionally additional animals, caught within Panama, would be included in the re-export consignment without being declared (Vallester, 1978).

Paraguay Figures compiled by the Ministerio de Agricultura y Ganaderia (Acevedo Gomez, 1987) showed that some 2000 skins of *B. constrictor* were exported from Paraguay in 1984, and that in 1986, 3114 pairs of shoes made from the skin of this species were exported to the USA. It was estimated that this accounted for the skins of 623 snakes, on the basis that each pair of shoes needed 35-40 cm of skin and that there were an average of 2 m of useful skin on each snake. Domestic trade was thought to exert a lesser effect on reptile populations.

St Lucia Since *B. constrictor* was declared protected, in 1980, the only recorded illegal trade was when an English tourist attempted to smuggle out five live boas. He was subsequently deported (St Lucia CITES MA, 1985).

Suriname Hoogmoed (1982a) writes that "there is no hunting for hides, nor is the natural habitat being destroyed. So, at least in Suriname, this species seems to be safe".

Venezuela There is said to be some persecution by farmers but no organised exploitation for the skin trade (Venezuela CITES MA, 1987). Gorzula (*in litt.*, 11 April 1986) considered that there might be some local trade as pets or for skins as curiosities.

Boa constrictor

INTERNATIONAL TRADE The only reports of international trade in *B. constrictor* are those contained in the Annual Reports of Parties to CITES. Some transactions were identified to the level of subspecies, the majority of these being *B. constrictor constrictor*, with only small quantities of *B. constrictor imperator*, but for the purposes of the following analysis all records for the species were lumped together. Only trade in live animals and skins was considered. The CITES reports are summarised in Tables 1 and 2. Trade in skins was sometimes recorded by length. It is notoriously difficult to convert this into numbers of skins, as it depends on the size of the snakes killed and on the method of preparation of the skin, however an average skin length of 1.4 m has been suggested (Anon., 1984). Acevedo Gomez (1987) considered that the average length of skins from Paraguay was 2.5 m, of which 2 m was usable skin. This may be excessive if the subspecies in trade is *B. constrictor amaralis*, which is usually nearer 1 m in length.

Table 1a shows that the annual trade in skins of *B. constrictor* may have reached nearly 125 000 in 1983, depending on the length conversion factor, and that, if anything, the volume of trade increased from 1980 to 1983, although the figures for 1984 and 1985 are markedly lower again. The chief net importing countries were the USA, Italy, Mexico, F.R. Germany, Spain, France and the UK.

The numbers of live animals in trade (Table 1b) were much lower, and have declined from 21 735 in 1980 to 1830 in 1983, but then increased sharply again to 18 418 in 1985. Between 70% and 92% of these were imported to the USA. It is not known whether the temporary decline in the level of this trade was due to a decline in demand for pet boas, a shortage of supply or stricter controls. In 1985 the trade in live animals exceeded the trade in skins.

Table 2a shows that the great majority of the skins were declared as having originated in Paraguay, although Argentina was the major source in 1984, with large quantities also originating in Colombia, Guyana, Peru and Suriname. In 1983, Panama emerged as the source of about 25 000 m of skins.

The majority of live snakes originated in Central America, Colombia and Suriname (Table 2b), which probably reflects the ease of supply to the main market in the USA. The dramatic increase in the volume of trade in 1985 was almost entirely attributable to snakes originating in El Salvador. The countries of origin indicate that the main subspecies used in the pet trade is *B. constrictor imperator* which is supposedly less suitable in temperament as a pet than *B. constrictor constrictor* (Breen, 1974). Most of the skins, where subspecies was declared, were of *B. constrictor constrictor*. Of the countries with no wild populations of *B. constrictor* the majority probably represent re-exports where the country of origin was not specified, or possibly captive-bred snakes not specified as such.

Table 1a. Minimum net commercial imports of *B. constrictor* skins reported to CITES.

	1980	1981	1982	1983	1984	1985
Andorra	-	-	-	50	-	-
Austria	-	-	20	7	-	8
Belgium	3444	-	4	-	7 m	-
Canada	1912	1972	150	167	31	1
	211 m	130 m	18 m	-	-	-
Chile	-	20	2	154	40	-
Denmark	46	-	95	-	-	-
Finland	-	-	-	-	-	16 m
France	108	616	393	-	3887	1050
	-	10 m	-	-	-	-
German D.R.	-	-	-	13 m	-	-
Germany, F.R.	7964	-	174	4185	95 m	-
Hong Kong	-	-	44	-	-	-
Israel	43	47	-	-	110	124 m
Italy	5550	18652	18676	17324	3740	6012
	24064 m	547 m	8789 m	-	7763 m	-
	-	750 m^2	-	-	-	-
Japan	-	-	-	76	-	-
Kuwait	-	-	-	-	-	1
Lebanon	-	-	-	-	67 m	-
Mexico	26	5192	9576	5838	400	3
Netherlands	332	-	-	-	-	-
New Zealand	14	-	-	-	105	-
Peru	6908	-	-	-	-	-
Saudi Arabia	-	-	40	-	-	14
Singapore	-	-	-	-	21	-
South Africa	-	12	-	-	-	-
Spain	3315	-	2216	7233	3924	-
	-	-	-	2455 m	-	-
Sweden	-	-	-	-	2	-
Switzerland	484	617	102	121	10	11
	-	5 m	-	4 m	-	-
Turkey	-	-	-	20	-	2500
UK	-	5000 m	5000 m	17	-	-
Uruguay	-	3246	-	758	359	-
USA	19156	53643	135	1695	10302	4711
	-	10971 m	20464 m	84865 m	698 m	800 m
	-	-	3290 kg	-	-	105 kg
Venezuela	18	319	119	-	-	5
Unknown	-	-	167	-	-	-
Total	49320	84336	31913	37645	22931	14316
	24275 m	16663 m	34271 m	87337 m	8630 m	940 m
	-	750 m^2	3290 kg	-	-	105 kg

Table 1b Minimum net commercial imports of live *B. constrictor* reported to CITES.

	1980	1981	1982	1983	1984	1985
Austria	203	8	3	–	63	41
Belgium	–	–	2	–	6	–
Canada	272	92	9	24	149	267
Colombia	–	–	–	–	–	1
Czechoslovakia	9	1	1	–	–	–
Denmark	4	4	3	–	54	12
Finland	–	–	4	–	–	–
France	–	5	–	12	8	10
German D.R.	165	–	–	–	–	1
Germany, F.R.	1764	356	373	117	1877	892
Greece	–	–	–	2	1	1
Honduras	–	–	1	–	–	–
Indonesia	–	–	–	3	–	5
Ireland	–	1	–	–	–	–
Israel	–	–	–	–	7	2
Italy	3	46	41	1	176	–
Jamaica	–	–	–	–	1	–
Japan	4	22	24	16	24	29
Korea, Rep of	–	–	1	–	–	–
Liberia	–	3	–	–	–	–
Malaysia	2	–	–	–	–	–
Martinique	–	–	–	–	1	–
Mexico	–	1	–	–	–	–
Netherlands	26	3	–	9	13	192
Poland	–	–	16	–	–	–
Romania	2	–	–	–	–	–
Saudi Arabia	–	–	4	2	–	–
Singapore	–	–	–	2	–	2
South Africa	–	–	2	–	2	–
Spain	–	–	8	13	1	15
Sri Lanka	2	–	–	–	–	–
Sweden	–	4	–	–	–	–
Switzerland	381	78	87	–	15	–
Tunisia	–	–	–	–	1	–
UAE	–	–	4	–	–	–
UK	327	370	141	39	239	173
USA	18206	12794	3605	1589	6285	16774
USSR	2	2	9	–	–	-1
Unknown	3	64	–	1	–	–
Uruguay	–	–	–	–	–	1
Total	21375	13854	4338	1830	8923	18418

Table 2a. Reported countries of origin or export for commercial exports of *B. constrictor* skins reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries with wild populations of *B. constrictor*						
Argentina	5174	11613	2592	259	12631	2189
	3154 m	1674 m	141 kg	1628 m	426 m	–
Bolivia	424	1	58	–	2	–
Brazil	2753	104	–	–	–	–
	5000 m	–	–	–	–	–
Colombia	592	5175	4126	270	–	1
	–	–	–	5281 m	–	–
Costa Rica	1	–	5	–	–	–
Ecuador	1	1	–	–	1	–
Guyana	–	–	–	2570	620	124 m
Honduras	1	1	1	1	–	–
Mexico	3	2	–	1	–	–
Nicaragua	2	–	–	–	–	5
Panama	–	1	9885	1585	28	10
	–	–	6764 m	24825 m	2199 m	–
Paraguay	23543	71294	16207	28313	12166	13085
	21121 m	8482 m	14491 m	89057 m	1484 m	800 m
	–	–	9 kg	–	–	105 kg
Peru	4	1	3140 kg	–	–	–
	–	3314 m	1986 m	–	–	–
Suriname	–	–	434	–	–	–
	–	750 m^2	1915 m	200 m	–	–
Trinidad & Tobago	–	1	–	–	–	–
Countries without wild populations of *B. constrictor*						
Guadeloupe	–	–	–	–	–	1
India	–	250 m	–	–	–	–
Indonesia	–	–	–	–	–	16 m
Italy	15	1	–	–	–	–
Nigeria	–	–	2510	–	–	–
Singapore	–	149	–	–	–	–
South Africa	–	–	24	–	–	–
Spain	1	–	–	–	–	–
Thailand	–	–	36	–	–	–
UK	2	–	–	–	–	–
USA	–	–	10991 m	6	–	–
Uruguay	–	–	–	–	–	–
Unknown	28403	7230	2526	5461	125	64
	–	4406 m	110 m	5206 m	4521 m	–
	–	–	1 kg	–	–	–

Boa constrictor

Table 2b Reported countries of origin or export for commercial exports of live *B. constrictor* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries with wild populations of *B. constrictor*						
Argentina	–	–	–	2	7	52
Belize	–	2	1	–	–	–
Bolivia	86	108	–	7	–	–
Brazil	–	1	–	–	–	6
Colombia	1215	11299	443	–	110	–
Costa Rica	–	2	1	–	2	–
Ecuador	–	1	6	–	–	–
El Salvador	124	11	280	1247	1759	14389
Fr. Guiana	–	2	3	–	–	–
Guatemala	15330	61	14	75	6327	1521
Guyana	130	354	154	227	247	429
Honduras	131	12	1	–	290	348
Mexico	–	4	94	50	25	–
Nicaragua	–	–	–	–	–	1
Panama	1374	379	3174	–	–	500
Paraguay	1802	34	–	–	4	1064
St Lucia	–	–	–	1	12	–
Suriname	3	1585	155	123	114	77
Trinidad & Tobago	–	1	–	–	–	1
Venezuela	–	2	1	–	4	–
Countries without wild populations of *B. constrictor*						
Australia	–	–	–	–	30	–
Austria	–	–	–	6	2	3
Canada	6	4	8	2	20	4
Czechoslovakia	–	1	–	–	–	–
Denmark	–	–	1	–	1	–
France	–	2	1	–	–	–
German D.R.	–	–	18	35	112	1
Germany, F.R.	145	–	1	2	16	1
Haiti	–	3	–	–	–	9
Martinique	–	–	–	–	1	–
Netherlands	–	–	9	–	–	1
Nigeria	–	–	–	1	–	–
Switzerland	2	11	–	89	6	48
Togo	–	–	–	1	–	–
UK	2	–	–	–	1	–
USA	304	109	11	19	65	127
Unknown	1312	532	108	20	4	3

CONSERVATION MEASURES The legal protection status of *B. constrictor* in various countries throughout its range is summarised in Table 3. On the basis of this information it appears that the species is protected in most of the major supplying countries: Paraguay, Argentina, Colombia, Peru and Panama. Furthermore the quantities of skins reported as originating in Paraguay are so large that it seems likely that they did not originate in the country but were smuggled over the border from Brazil.

Table 3. Legal prohibition on the commercial hunting, internal trade and commercial export of *B. constrictor*. Dates are those on which the legislation came into force. A - All live animals & parts; L - Live animals only; S - Skins; P - Allowed under permit; C - Closed seasons or quotas may be imposed; * - these territories are Overseas Départements of France with which the EEC may trade without the imposition of CITES controls; ? - no information (Fuller *et al.*, 1987).

	CITES	Hunting	Trade	Export
Argentina	1981	A 1983	A 1983	A 1986
Belize	1981	-	A 1981	A 1981
Bolivia	1979	A 1979	A 1979	A 1979
Brazil	1975	A 1967	A 1967	A 1967
Colombia	1981	A 1973	A 1973	A 1973
Costa Rica	1975	A 1985	A 1970	A 1970
Dominica	-	?	?	?
Ecuador	1975	-	-	A 1981
El Salvador	1987	-	-	P 1985
Fr. Guiana	1978 *	-	A 1986	A 1986
Fr. W. Indies	1978 *	-	-	P
Guatemala	1980	-	-	C 1987
Guyana	1977	-	-	A 1986 +
Honduras	1985	-	-	C 1978
Mexico	-	C 1951	-	A 1982
Nicaragua	1977	A 1977	A 1977	A 1977
Panama	1978	A 1980	A 1980	A 1980
Paraguay	1977	A 1975 ++	A 1975	A 1975 ++
Peru	1975	A 1973	A 1973	A 1973
St Lucia	1982	A 1980	A 1980	A 1980
Suriname	1981	-	-	P
Trinidad & Tobago	1984	A 1958	A 1958	A 1958
Venezuela	1978	A 1970	A 1970	A 1970

\+ Export quotas of 600 live *B. constrictor* and 500 skins were suggested for 1987 and 1988.

++ On 17 February 1986, Decree 13806 allowed the export of 50 000 pairs of shoes made from *B. constrictor* and *Eunectes* spp. over the period of one year. The ban on hunting was also relaxed for this purpose. A further decree, No. 19815 of 6 February 1987, extended this dispensation for a further year without specifying the number of shoes.

CAPTIVE BREEDING *B. constrictor* is regularly kept both in zoological collections and as a pet. *B. constrictor imperator* is reported to be difficult to tame, whereas *B. constrictor constrictor* adapts much better to captivity (Breen, 1974).

Boa constrictor

An international survey of 260 zoological collections in 1985 (Slavens, 1985) revealed the following information on the keeping and breeding of various subspecies.

B. constrictor amarali: a total of 6 animals kept in 2 different collections. No breeding recorded.

B. constrictor constrictor: a total of 223 animals kept in 38 different collections. Breeding recorded in 8 collections, a total of 183 young surviving.

B. constrictor imperator: a total of 22 animals kept in 10 different collections. No breeding recorded.

B. constrictor nebulosa: a total of 8 animals kept in 3 different collections. No breeding recorded.

B. constrictor occidentalis: a total of 34 animals kept in 12 different collections. No breeding recorded.

B. constrictor orophias: a total of 7 animals kept in 3 different collections. No breeding recorded.

B. constrictor ortoni: a total of 8 animals kept in 4 different collections. No breeding recorded.

B. constrictor sigma (=*B. constrictor imperator* ?): a total of 2 animals kept in 1 collection. No breeding recorded.

B. constrictor subspp.: a total of 213 animals kept in 48 different collections. Breeding recorded in 7 collections, a total of 221 young surviving.

There is one record of commercial captive breeding of *B. constrictor* in Latin America. A company in Panama, called Panama Sanchez, established a captive-breeding operation for boa constrictors (*Boa constrictor*) in April 1981 near Panama City. The operation was allowed to collect adult snakes and built up a breeding stock of 100 animals. Live snakes were exported to Miami, USA, under five permits issued over the period 1981/1982.
375 snakes were exported in 1981 and 3355 in 1982. In July 1983 the operation was closed after bad management practices caused the Government to suspend permission to operate (D.M. Botello, *in litt.*, 9 November 1983).

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ANACONDA

Recommended list: 2
[Possible problem]

Eunectes murinus (Linnaeus, 1758)

Order SERPENTES

Family BOIDAE

SUMMARY AND CONCLUSIONS The largest snake in South America, found in the drainage basins of the Orinoco and the Amazon. Primarily aquatic, inhabiting large rivers and swamps, and possibly growing to lengths in excess of 10 m. Prey includes a variety of mammals, up to the size of peccaries, and reptiles. Brood sizes range from 14 to 82. Population levels are unknown.

The species is not extensively used for food, but may be persecuted for cultural reasons. There is a substantial skin trade, probably over 20 000 animals a year, mostly declared as originating in Paraguay, Bolivia and Guyana, but in reality probably deriving from Brazil. There is also a low level of trade in live animals, probably for the pet trade.

Sustainable hunting rates cannot be estimated, owing to the almost complete lack of population data, but the majority of the trade is currently illegal and originates in countries where the species is protected. Importing countries should not permit imports from these countries, but this requirement is obviously being ignored. The chief importing countries are the USA, Italy and France.

DISTRIBUTION Found in moist forests and swamps in the drainage basins of the Orinoco and Amazon. The species has been divided into two subspecies: *Eunectes murinus scytale* (formerly *Eunectes murinus murinus*), found in the Amazonian region; and *Eunectes murinus murinus* (formerly *Eunectes murinus gigas*), found chiefly in Venezuela and Guiana. However as there is not agreement on the subspecific names, and as *E. murinus murinus* could apply to either subspecies, giving considerable potential for confusion, the subspecies are not considered separately in this account.

Bolivia Found in the Amazonian region (Hoogmoed, 1979).

Brazil Widespread in the Amazonian region, but absent from the Atlantic forests (Dixon, 1979; Hoogmoed, 1979; Hoogmoed, 1982b).

Colombia Found in the Amazonian region (Hoogmoed, 1979).

Ecuador Found in the Amazonian region (Hoogmoed, 1979; Miyata, 1982).

French Guiana Present (Gasc and Rodrigues, 1980; Hoogmoed, 1982b).

Guyana Found in the Amazonian region (Hoogmoed, 1982b).

Peru Recorded from Quistococha, Iquitos, Rio Napo region (Dixon and Soini, 1986).

Paraguay There is a single record of *E. murinus* from a swamp in the Parque Nacional Cerro Cora (Anon., 1982). Scott (*in litt.*, 2 April 1982) reports that it is apparently found near all of the large rivers in the East of the country. There is dispute as to whether these records may have been confused with *E. notaeus*.

Suriname Present (Hoogmoed, 1982a; 1982b).

Eunectes murinus

Trinidad and Tobago Recorded from Trinidad, but not from Tobago (Emsley, 1977; Hardy, 1982).

Venezuela The distribution covers the Orinoco and Maracaibo basins, including all the tributaries. The species has not been found in the north of the country except in the Orinoco Delta and in Caripito (Roze, 1966). Found in the Llanos and Yunari Savanna of central Venezuela (Rivero-Blanco and Dixon), and also in the Amazonian region (Hoogmoed, 1979; Hoogmoed, 1982b). Probably does not occur above 500 m (S. Gorzula, *in litt.*, 11 April 1986).

POPULATION

Bolivia No information.

Brazil No information.

Colombia No information.

Ecuador No information.

French Guiana Said to be relatively abundant, though rarely reported (Gasc and Rodrigues, 1980).

Guyana No information.

Paraguay Before the single published record of *E. murinus*, reported in 1982, the species was not considered to occur in the country (Peters and Orejas-Miranda 1970). It must therefore be considered to be rare, if present at all.

Peru Said to be common in and around flooded forests and large and small streams where aquatic vegetation is dense (Dixon and Soini, 1986).

Suriname Said to occur in reasonable numbers (Hoogmoed, 1982a).

Trinidad and Tobago Locally common in the Narira Swamp and the larger rivers of Trinidad, but does not occur in Tobago (Emsley, 1977; Hardy, 1982).

Venezuela Gorzula (*in litt.*, 11 April 1986) considered that the species was frequent in Venezuela, saying aestivating animals could readily be found in receding lagoons in the Llanos in the dry season. In the right habitat in southern Venezuela and Sucre, specimens are found more rarely - about one every 40-50 man days.

HABITAT AND ECOLOGY Claimed by some to be the world's largest snake, *Eunectes murinus* is almost certainly the heaviest, weighing up to a tonne, although the maximum authenticated length of 7.63 m is exceeded by *Python reticulatus* (Emsley, 1977; Freiberg, 1982). Unauthenticated reports put the maximum length at 12-14 m (Pope, 1962), and it is not unlikely that snakes of this size occur (Best, 1984).

E. murinus is primarily nocturnal and aquatic, inhabiting swamps and slow-flowing rivers. It occasionally emerges to rest on branches or sand banks but is never found far from water, and always returns to water when threatened. The young tend to be more arboreal than the adults (Pope, 1962; Emsley, 1977). Usually solitary, there are isolated records of aggregations of up to 11 snakes (Pope, 1962), although these may be associated with mating behaviour. Owing to its large bulk, it is relatively sluggish on land but can move with great rapidity in the water (Belloumini *et al.*, 1976/77).

The growth of *E. murinus* has been studied in captivity. Young emerge at a length of about 70 cm, although hatchlings as small as 36-52 cm have been reported (Belloumini *et al.*, 1976/77). Holstrom (1980) reports three broods of hatchlings averaging 74.8-87.7 cm in length and weighing 206-265 g. At 11 months Deschanel (1978) reported that young had grown to 140-157 cm (1.65-1.91 kg), and at five years lengths of 3.1-3.2 m (17-27 kg) have been recorded. After the age of three years, the increase in length slows but the snake continues to increase in weight. Snakes of 4-5 m commonly weigh 50-100 kg (Belloumini *et al.*, 1976/77). The record age in captivity is 29 years (Emsley, 1977).

Ecdysis occurs about six times a year in captivity. A young captive male moulted 30 times during its first five years of life (Belloumini *et al.*, 1976/77), while six- to seven-year-old females moulted five to seven times a year. The moulting frequency increases during gestation (Holstrom, 1980).

E. murinus is viviparous; the gestation period has been reported to vary from six to nine months (Belloumini *et al.*, 1976/77; Deschanel, 1978; Holstrom, 1980; Holmstrom, 1982). Brood sizes have been reported to vary from 14 (Deschanel, 1978) to 82, larger mothers having more young, although the size of the young is inversely correlated with the size of the mother (Belloumini *et al.*, 1976/77). Mating always takes place in the water and, in Trinidad, usually occurs in December and January, the young emerging in July and August (Emsley, 1977). In captivity, heterologous mating between *E. murinus* and *Eunectes notaeus* has been recorded, though no young were produced (Veinert and Belloumini, 1980/81).

The prey is killed by constriction, a great variety of species being taken. Emsley (1977) lists agoutis, Paca, cavies, peccaries, deer, monkeys, birds, caiman, turtles, and some occasional domestic animals, but considers it doubtful that they eat fish, although Pope (1962) reports considerable quantities of fish from the stomachs of specimens taken in Guyana. The size of the prey depends on the size of the snake. A 25-foot (7.6-m) Anaconda was found in French Guiana with a 100-lb (45-kg) pig (possibly a peccary) in its stomach (Pope, 1962). The prey is always taken near water, and is usually drawn underwater for constriction. One snake was observed to remain underwater for 17 minutes with its prey (Emsley, 1977). Young Anacondas tend to ingest their prey underwater, while older animals often do so on the surface (Belloumini *et al.*, 1976/77).

A female in captivity ate a total of 88.9 kg of food in her first five years of life, during which time she grew to a weight of 22 kg. A male sibling ate a total of 79.9 kg and grew to 17 kg during the same period (Belloumini *et al.*, 1976/77).

THREATS TO SURVIVAL *E. murinus* is hunted chiefly for its skin, although its flesh is occasionally eaten. Gasc and Rodrigues (1980) reported that it was found "throughout" French Guiana on the menus of restaurants specialising in exotic foods. Pope (1962) considered that the consumption of snakes was not widespread in South America. The native peoples of French Guiana have a strong aversion to Anacondas for cultural reasons, and are unwilling to kill, or even look at them (Gasc and Rodrigues, 1980). Live animals are extensively traded as pets. A pet supply company in the USA (South American Unlimited, New York) included Anacondas on its price list in 1985 at US$60 each. Most of the animals traded as pets are thought to be small, and therefore this trade is likely to be less damaging to the population than the skin trade, which would tend to use larger animals. There is very little detailed information regarding exploitation. The species adapts readily to irrigation dams and other man-made water bodies (S. Gorzula, *in litt.*, 11 April 1986).

Brazil In July 1984, IBDF (Instituto Brasileiro de Desenvolvimento Florestal) seized a shipment of 140 tanned snake skins (*B. constrictor* and *Eunectes murinus*) in Porto Alegre. The skins were en route from Belem to Sao Leppoldo and were thought to be destined for eventual export once they had been manufactured into shoes and other products (Palazzo, J.T., *in litt.* 1984).

Paraguay Scott (*in litt.*, 2 April 1982) reports that all *E. murinus* that are found are usually killed. The habitat where it is found, along the large rivers in eastern Paraguay, is rapidly being settled. Figures compiled by the Ministerio de Agricultura y Ganaderia (Acevedo Gomez, 1987) showed that some 12 000 skins of *E. murinus* were exported from Paraguay in 1984.

Suriname Hoogmoed (1982a) writes that "there is no hunting for hides, nor is the natural habitat being destroyed. So, at least in Suriname, this species seems to be safe".

Venezuela Anacondas are killed very occasionally in Venezuela by ranchers when they have taken cattle. There is thought to be no exploitation for meat and little for the skin or pet trade. There are locally held beliefs that anacondas, known as "madre de agua", prevent lagoons from drying out (S. Gorzula, *in litt.*, 11 April 1986).

INTERNATIONAL TRADE The only reports of international trade in *E. murinus* are those contained in the Annual Reports of Parties to CITES. Only trade in live animals and skins was considered.

Trade in skins was sometimes recorded by length. It is notoriously difficult to convert this into numbers of skins, as it depends on the size of the snakes killed and on the method of preparation of the skin, however an average skin length of 2.1 m has been suggested (Anon., 1984). It must be stressed that with a snake which shows such a potential range of lengths, it seems unsafe to put too much reliance on this figure.

Table 1a shows that the annual trade in skins of *E. murinus* declined from a the high levels in 1980 and 1981 to about a third of the peak volume in 1985. The reason for the temporary decline in 1983 is not known. It could be associated with a decline in the demand for reptile skins reported by some dealers (A. Sarkissian, *in litt.*, 27 January 1986); or with protection measures in the countries of origin.

The numbers of *E. murinus* traded live (Table 1b) are insignificant compared with the numbers of skins in trade. The small quantities suggest either that the pet trade is very limited or that most of them are destined for zoological collections.

The reported countries of origin of the skins are shown in Table 2a. The great majority of skins are reported to have originated in Paraguay, a country in which there are very few records of *E. murinus*. It is possible that these skins, and those reported as originating in Argentina, were mistakenly identified *Eunectes notaeus* skins, but independent evidence (Acevedo Gomez, 1987) confirms that substantial quantities of *E. murinus* are exported from Paraguay, and so it seems likely that they are yet another example of the vast illegal trade in wildlife skins which pours across Brazil's southern border. There has been a much smaller number of skins reported as originating in Brazil itself, which has a ban on all trade in wildlife. Skins originating in Colombia made a significant contribution to the world volume of trade in 1983 in spite of the fact that exports are illegal. Bolivia and Guyana were major suppliers in 1984 and 1985. Skins reported as originating in Indonesia, Thailand and Nigeria are probably species of *Python*. Those from the other

unacceptable countries of origin probably represent re-exports not specified as such. Panama, the source of about a quarter of the world's supply of *E. murinus* skins in 1983, is noteworthy as it is known to be a major entrepot for wildlife products from South America (Vallester, 1978). The major consignment from Singapore in 1985 may also have been a re-export.

Table 1a. Minimum net commercial imports of *E. murinus* skins reported to CITES.

	1980	1981	1982	1983	1984	1985
Austria	6984	–	–	–	–	–
Brasil	–	–	82	–	–	–
Canada	–	2	–	1	–	–
	–	29 m	36 m	–	–	–
France	–	–	54	2	2645	–
	–	2 m	–	12 m	–	–
Germany, F.R.	–	–	–	3	–	–
	–	–	–	250 m	–	–
Hong Kong	–	–	–	–	2	–
Israel	215 m	89 m	–	–	1	–
Italy	675	500	942	5621	–	–
	–	1300 m	6778 m	4850 m	11053 m	–
	110 kg	1739 m^2	–	–	–	–
Japan	–	–	–	–	–	4000
Mexico	–	–	158	–	–	–
	–	–	22 m	–	–	–
	–	–	120 kg	–	–	1 kg
New Zealand	–	–	1	–	–	–
South Africa	818	–	–	–	–	–
Spain	–	–	–	39 m	–	–
Sweden	–	–	–	–	1	–
Turkey	–	–	–	20	–	–
UK	1443 m	–	–	–	–	–
USA	11717	17730	4188	36	12938	4559
	14041 m	23765 m	8029 m	632 m	2353 m	1500 m
	–	–	1010 kg	–	–	119 kg
Total	20194	18232	5425	5683	15587	8559
	15699 m	25185 m	14865 m	5783 m	13406 m	1500 m
	110 kg	1739 m^2	1130 kg	–	–	120 kg

Table 1b. Minimum net commercial imports of live *E. murinus* reported to CITES

	1980	1981	1982	1983	1984	1985
Australia	–	–	–	–	–	2
Austria	6	1	–	–	2	–
Belgium	–	2	–	–	–	–
Canada	7	–	–	5	9	10
Czechoslovakia	–	–	–	1	–	–
Denmark	2	–	–	–	1	1
Dominican Rep	2	–	–	–	–	–
Germany, F.R.	39	35	26	24	3	70
Hungary	–	3	–	–	–	–
Indonesia	–	–	–	3	–	–
Israel	–	–	–	–	–	1
Italy	7	–	2	17	–	4
Japan	2	11	5	15	13	4
Korea, Rep of	–	–	–	–	1	1
Mexico	2	–	–	–	–	–
Netherlands	–	–	–	2	12	52
Poland	–	–	7	6	–	–
Singapore	–	2	–	–	3	–
South Africa	–	2	–	–	2	–
Spain	–	1	–	–	1	–
Sweden	–	–	–	–	2	1
Switzerland	2	3	4	3	2	10
Trinidad & Tobago	–	–	–	–	2	–
UAE	–	–	2	–	–	–
UK	24	11	20	18	19	2
USA	255	137	110	214	287	152
Unknown	–	3	–	–	–	–
Total	348	211	176	308	359	310

Table 2a Reported countries of origin or export for commercial exports of skins of *E. murinus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries with wild populations of *E. murinus*						
Bolivia	1	–	–	–	1101	20
	–	–	–	–	6300 m	–
Brazil	1114	459	99 kg	2 kg	–	166
	872 m	1650 m	607 m	585 m	–	–
	–	500 m^2	–	–	–	1 kg
Colombia	–	1	1	2500	–	–
Guyana	–	–	–	1888	4365	2100
	–	–	–	–	6000 m	–
Paraguay	6730	11394	4438	1266	11014	2011
	8091 m	5289 m	8264 m	2228 m	1407 m	1500 m
	–	250 m^2	–	–	–	120 kg
Peru	6710	–	158	–	–	–
	–	4749 m	21 kg	3 kg	–	–
Suriname	110 kg	–	–	–	–	–
Trinidad & Tobago	–	1	–	–	–	–

Table 2a continued

	1980	1981	1982	1983	1984	1985
Countries without wild populations of *E. murinus*						
Argentina	5639	5678	739	–	–	825
	499 m	8069 m	1579 m	–	–	–
	–	989 m^2	–	–	–	–
Belgium	–	–	–	–	200	–
Canada	–	–	1	–	–	–
Indonesia	–	636	–	–	2	–
Netherlands	168	–	–	–	–	–
	6215 m	–	–	–	–	–
Nigeria	1	–	246	–	–	–
Panama	–	–	–	3794 m	–	–
Singapore	–	–	–	–	–	4000
Spain	136	1052 m	–	–	–	–
Thailand	228	–	–	–	–	–
	22 m	–	–	–	–	–
USA	–	–	2294	–	–	–
	–	–	4450 m	–	–	–
Unknown	8992	2357	1130 kg	28	1627	–
	1056 m	6026 m	550 m	12 m	946 m	–

Table 2b. Reported countries of origin or export for commercial exports of live *E. murinus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries with wild populations of *E. murinus*						
Bolivia	2	1	–	–	–	–
French Guiana	–	3	1	–	–	–
Guyana	346	202	139	219	232	213
Paraguay	6	–	–	–	–	–
Peru	–	1	–	–	–	–
Suriname	–	2	35	88	122	97
Venezuela	–	–	–	–	4	–
Countries without wild populations of *E. murinus*						
Canada	–	2	4	–	–	–
Finland	–	–	–	–	1	–
France	–	3	–	–	–	–
Guatemala	3	–	–	–	–	–
Haiti	2	–	–	–	–	–
Honduras	–	2	–	–	–	–
USA	8	11	9	5	8	2
Unknown	35	25	2	4	–	–

CONSERVATION MEASURES The legal protection status of *E. murinus* in various countries throughout its range is summarised in Table 3. On the basis of this information it appears that the species is protected in most of the major supplying countries: Paraguay, Argentina, Colombia, Bolivia, Brazil, Peru and Panama. Furthermore the species does not occur in Argentina or Panama, and is extremely rare in Paraguay, indicating that the skins were acquired elsewhere. None of these countries should therefore have been acceptable to the CITES Management Authorities who granted import licences for the skins. The emergence of Guyana as a major source of skins in 1983 and 1984 is disturbing as *E. murinus* is not protected there. While it is possible that the skins were acquired within the country it is also possible that they derived from illegal imports from Brazil, as is the case with other wildlife products. The Brazilian authorities have already begun action to curb the poaching and illegal traffic in the South of the country, but the problem is so vast that little improvement is yet apparent (Hyman, 1985).

Table 3. Legal prohibition on the hunting, internal trade and commercial export of *E. murinus*. Dates are those on which the legislation came into force. A - All live animals & parts; P - Allowed under permit; * - these territories are Overseas Départements of France with which the EEC may trade without the imposition of CITES controls (Fuller *et al.*, 1987).

	CITES	Hunting	Trade	Export
Bolivia	1979	A 1979	A 1979	A 1979
Brazil	1975	A 1967	A 1967	A 1967
Colombia	1981	A 1973	A 1973	A 1973
Ecuador	1975	-	-	A 1981
Fr. Guiana	1978 *	-	A 1986	A 1986
Guyana	1977	-	-	A 1986 +
Paraguay	1977	-	A 1975	A 1975 ++
Peru	1975	A 1973	A 1973	A 1973
Suriname	1981	-	-	P
Venezuela	1978	A 1970	A 1970	A 1970

\+ Export quotas of 600 live *B. constrictor* and 500 skins were suggested for 1987 and 1988.
++ On 17 February 1986, Decree 13806 allowed the export of 50 000 pairs of shoes made from *B. constrictor* and *Eunectes* spp. over the period of one year. The ban on hunting was also relaxed for this purpose. A further decree, No. 19815 of 6 February 1987, extended this dispensation for a further year without specifying the number of shoes.

CAPTIVE BREEDING *E. murinus* is regularly kept both in zoological collections and as a pet. It is reported to be relatively aggressive in temperament and to strike readily (Emsley, 1977).

An international survey of 260 zoological collections in 1985 (Slavens, 1985) revealed a total of 48 animals kept in 15 different collections. Breeding was not reported in 1985, although it had occurred in previous years.

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YELLOW ANACONDA

Recommended list: 2
[Possible problem]

Eunectes notaeus Cope, 1862

Order SERPENTES

Family BOIDAE

SUMMARY AND CONCLUSIONS Distributed in large rivers and swamps in sub-tropical South America, from Bolivia to Argentina. Primarily aquatic, growing to a maximum length of 4 m. Very little is known about its ecology or population size.

Apart from limited trade in live specimens, probably for zoological collections, the main trade is in skins, mostly declared as originating in Paraguay, Bolivia and Argentina. The volume of this trade appears to have increased dramatically since 1980 to some 37 000 skins in 1984.

The data available are insufficient to set sustainable hunting rates, but the species is protected in its main countries of origin. With the exception of a few skins from Bolivia, all exports should not have been accepted by the importing countries, but this requirement appears to have been ignored. The main importing countries are the USA, France and Italy. From 1985 onwards the species has been protected in all the source countries.

DISTRIBUTION Found in sub-tropical South America, from Bolivia to northern Argentina.

Argentina Confined to the north-east, in the Chaco, Corrientes and Santiago del Estero (Gallardo, 1977; Freiberg, 1982).

Bolivia Present (Peters and Orejas-Miranda, 1970).

Brazil Confined to the south-west of the country (Freiberg, 1982).

Paraguay Present (Peters and Orejas-Miranda, 1970).

Uruguay Present (Peters and Orejas-Miranda, 1970).

POPULATION There is no information on the status of populations in any of the source countries.

HABITAT AND ECOLOGY *Eunectes notaeus* is similar in habits to *Eunectes murinus*, being largely aquatic, and inhabiting large rivers and swamps. It is smaller, usually between 2 m and 3 m in length, with a maximum of 4 m (Freiberg, 1982).

There is little information on the growth rate, but 37 young were born at New York Zoological Park at lengths of 535–780 mm (mean 639 mm), weighing 95–180 g (mean 137 g). At two years of age they had grown to an average length of 1.78 m, weighing 2.6 kg (Holmstrom, 1981). A male *E. notaeus* at Sao Paulo Zoo grew from 2.00 m (5.0 kg) to 2.25 m (9.0 kg) in four years (Veinart and Belloumini, 1980/81).

Like all New World boids, *E. notaeus* is ovoviviparous. Broods of 6 to 13 have been reported (Belloumini *et al.*, 1976/77; Holmstrom, 1981). Gestation appears to take from four to six months, and at New York Zoological Park, births occurred from April to October (Holmstrom, 1981; Holmstrom, 1982). One

of the males in this collection began courtship at an age of 21 months (Holmstrom, 1981), and a female gave birth at four years, two months of age (Holmstrom, 1982). The oldest female gave birth to three broods, totalling 31 offspring, in successive years with 13-month intervals between each birth (Holmstrom, 1981). In captivity, heterologous mating between *E. notaeus* and *Eunectes murinus* has been recorded, though no young were produced (Veinert and Belloumini, 1980/81).

Prey is killed by constriction, and is thought to consist of mammals and reptiles. Young snakes born in a Zoo did not start feeding until one to four months after birth (Holmstrom, 1981).

THREATS TO SURVIVAL *E. notaeus* is hunted chiefly for its skin, and also occasionally for meat. It is reputed to have the best flavour of all boids (Gallardo, 1977).

Paraguay Scott (*in litt.*, 2 April 1982) asserted that it was not hunted much in Paraguay. The habitat where it is found, along the large rivers in eastern Paraguay, is rapidly being settled. Figures compiled by the Ministerio de Agricultura y Ganaderia (Acevedo Gomez, 1987) showed that some 10 000 skins of *E. notaeus* were exported from Paraguay in 1984.

Table 1a Minimum net commercial imports of *E. notaeus* skins reported to CITES.

	1980	1981	1982	1983	1984	1985
Australia	–	–	7	–	–	–
Canada	–	4	289	52	37	1
France	–	–	–	2 m	12177	–
Germany, F.R.	1	2768	236	122	–	–
	–	3000 m	–	–	–	–
Hong Kong	–	–	–	3	–	–
Italy	58	123	–	–	–	2466
	950 m^2	–	42 m	8260 m	6376 m	–
Japan	–	–	–	–	–	253
Korea, Rep of	–	–	–	–	24	–
Mexico	–	–	539	603	1 m^2	–
New Zealand	–	–	20	–	1	–
Panama	–	–	1317	–	–	–
Peru	–	–	–	4375	–	–
Singapore	–	–	1	–	–	–
Spain	–	1380	–	–	–	–
Switzerland	526	–	2	34	–	4
Turkey	–	–	–	13	–	–
UK	–	5000 m	–	–	75 m	–
USA	891	1721	13973	–	18113	14712
	–	6226 m	34851 m	1721 m	2702 m	2389 m
	–	–	–	–	4 kg	13 m^2
Venezuela	–	13	–	–	–	–
Unknown	–	–	–	3	–	–
Total	1476	6009	16384	5205	30352	17435
	–	14226 m	34893 m	9983 m	9153 m	2389 m
	950 m^2	–	–	1 m^2	13 m^2	964 m^2
	–	–	–	–	4 kg	–

Table 1b. Minimum net commercial imports of live *E. notaeus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Belgium	–	–	–	–	–	7
Canada	1	2	–	–	–	–
Czechoslovakia	–	1	–	–	–	–
Denmark	–	2	–	–	–	–
France	–	3	–	–	–	–
German D.R.	2	–	8	2	–	–
Germany, F.R.	40	3	10	3	–	–
Hungary	–	2	–	–	–	–
Italy	2	–	–	3	–	9
Japan	–	2	–	–	–	–
Netherlands	–	–	–	–	–	8
Poland	–	–	–	4	–	–
Switzerland	7	–	–	–	–	–
UK	–	6	10	–	–	–
USA	9	47	2	13	23	–
USSR	–	–	–	–	2	–
Total	61	68	30	25	25	24

INTERNATIONAL TRADE The only reports of international trade in *E. notaeus* are those contained in the Annual Reports of Parties to CITES. Only trade in live animals and skins was considered. The CITES reports are summarised in Tables 1 and 2. Trade in skins was sometimes recorded by length. It is notoriously difficult to convert this into numbers of skins, as it depends on the size of the snakes killed and on the method of preparation of the skin, however an average skin length of 1.4 m has been suggested (Anon., 1984). It must be stressed that with a snake which shows such a potential range of lengths, it seems unsafe to put too much reliance on this figure.

The minimum net trade in skins of *E. notaeus* (Table 1a) has increased from comparatively low levels in 1980 to about 37 000 in 1984 but declined again in 1985. This pattern differs significantly from the trade in skins of *E. murinus*, which has been declining slightly since 1980. It is possible that, as the supply of *E. murinus* skins has been curtailed, the trade has switched to *E. notaeus*. The chief importing countries appear to be the USA, F.R. Germany, Italy and the UK.

The trade in live animals (Table 1b) has been minimal, and is probably mostly connected with zoological collections.

The great majority of skins were declared as originating in Paraguay, Argentina and Bolivia, and, for once, there is no real reason to doubt this, as the species occurs in all of these countries. However it seems likely that a certain number of skins will have originated in neighbouring Pantanal of Brazil and have entered Paraguay along with the other illegal traffic in wildlife products. Small numbers of skins were declared as originating in Brazil and Uruguay. Among the countries of origin not having wild populations of *E. notaeus*, the majority probably represent re-exports without the country of origin having been specified, or of captive-bred specimens not reported as such. Skins originating in Indonesia and Thailand were possibly of another species of snake, *Python* sp., for instance. In 1982 and 1983, Peru

Eunectes notaeus

Table 2a. Reported countries of origin or export for commercial exports of skins of *E. notaeus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries with wild populations of *E. notaeus*						
Argentina	4	–	–	363	8844	2596
	–	200 m^2	–	7466 m	6376 m	1486 m
Bolivia	–	1	–	–	13489	2950
	–	–	–	–	–	886 m
Brazil	–	28	45	396	–	–
Paraguay	420	2424	14526	9888	11368	11157
	–	9482 m	33871 m	2551 m	2590 m	–
	–	750 m^2	–	7 kg	4 kg	–
Uruguay	–	–	–	61	–	–
Countries without wild populations of *E. notaeus*						
Colombia	–	–	–	–	185 m	–
France	–	–	1022 m	–	–	–
Guyana	–	2	–	–	645	–
Indonesia	–	–	–	60	–	–
Netherlands	1472	35	–	33 kg	–	–
Panama	–	–	–	–	190	2244
Peru	–	–	7802 m	1075	746	544
South Africa	–	–	–	–	60	1
Thailand	–	–	–	319	165	–
Unknown	–	3866	2211	228	–	50
	–	6244 m	42 m	27 m	–	17 m
	–	–	–	–	–	13 m^2

Table 2b. Reported countries of origin or export for commercial exports of live *E. notaeus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries with wild populations of *E. notaeus*						
Paraguay	61	59	2	–	–	–
Countries without wild populations of *E. notaeus*						
Austria	–	–	–	–	–	2
Canada	–	–	8	14	19	–
Czechoslovaia	–	–	10	–	–	–
Germany, F.R.	–	–	–	–	–	6
Guyana	–	6	–	3	–	–
Suriname	–	–	–	–	2	–
Switzerland	7	8	10	7	–	18
USA	6	6	6	4	2	7
Unknown	7	–	2	4	–	2

was declared as the origin of large quantities of skins, although *E. notaeus* does not occur in the country. These skins must therefore either have been imported from elsewhere or have been misidentified skins of *E. murinus*. There is no evidence to suggest which of these two explanations is the more likely.

CONSERVATION MEASURES The legal protection status of *E. notaeus* in various countries throughout its range is summarised in Table 3. The species receives nominal protection in all its potential countries of origin, and all exports of skins, except for skins from Bolivia (Table 2a), have therefore been illegal. It is difficult to understand why such trade in the skins of *E. notaeus* has been sanctioned by importing CITES Management Authorities. Since August 1985, when Bolivia banned the export of wildlife products, there have been no legal sources of skins of this species.

Table 3 Legal prohibition on the hunting, internal trade and commercial export of *E. notaeus*. Dates are those on which the legislation came into force. A - All live animals & parts; L - Live animals only; S - Skins; P - Allowed under permit; C - Closed seasons may be imposed; ? - no information (Fuller *et al.*, 1987).

	CITES	Hunting	Trade	Export
Argentina	1981	A 1983	A 1983	A 1986
Bolivia	1979	-	S 1979	L 1984 +
Brazil	1975	-	A 1967	A 1967
Paraguay	1977	A 1975	A 1975	A 1975 ++
Uruguay	1975	A 1978	A 1978	A 1978

+ all wildlife exports have been banned since August 1985.
++ On 17 February 1986, Decree 13806 allowed the export of 50 000 pairs of shoes made from *B. constrictor* and *Eunectes* spp. over the period of one year. The ban on hunting was also relaxed for this purpose. A further decree, No. 19815 of 6 February 1987, extended this dispensation for a further year without specifying the number of shoes.

CAPTIVE BREEDING *E. notaeus* is regularly kept in zoological collections. A survey of 260 zoological collections in 1985 (Slavens, 1985) revealed a total of 61 animals kept in 18 different collections. Breeding was reported in two collections, a total of 20 live being born.

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BLOOD PYTHON, SHORT PYTHON

Recommended list: 2
[Possible problem]

Python curtus Schlegel, 1872

Order SERPENTES

Family BOIDAE

SUMMARY AND CONCLUSIONS A small South East Asian python, restricted to the southern half of the Malay Peninsula, Bangka, Borneo and Sumatra; seemingly local in distribution. Variously regarded as rare or moderately common, although no population surveys are available. Consistently reported much rarer than *Python reticulatus*. Said to prefer swamp forest or heavy jungle along watercourses, also occurs in secondary growth. Nocturnal, often enters water, feeds on small vertebrates. Clutch of 10-15 eggs is much smaller than in congeneric species. Possibly threatened by habitat changes, although no substantiating data are available; more likely to be threatened by over-exploitation.

The volume of the skin trade as shown by CITES reports increased sharply from 935 in 1980 to some 58 500 in 1985. The USA, Italy, Japan and Canada were the main importers. Most of the skins originated in Indonesia. The volume of trade in live animals declined from 359 in 1980 to only 43 in 1985. This rise in international skin trade may perhaps in part be attributed to legislation affecting other exploited species.

It seems possible that this size of harvest may not be sustainable in the long term, particularly as it appears to be increasing rapidly; a prime requirement is to obtain relevant data on population levels, distribution, and the effects of trade, with a view to appropriate management. Such data are required most urgently for Indonesia, the reported origin of the great majority of animals in the skin trade.

DISTRIBUTION A South East Asian species, with a somewhat more restricted distribution than other *Python* in the region. Present in the southern half of the Malay Peninsula and certain islands of the Indo-Australian archipelago. As noted below, the species appears to be largely confined to swamp forest and heavy jungle along watercourses, and is thus likely to be sporadically distributed within its general range.

Brunei Almost certainly present, but no specific records are at hand.

Indonesia Restricted to Bangka, Sumatra and Kalimantan (De Haas, 1950, De Rooij, 1917).

Malaysia Recorded from Peninsular Malaysia, Sabah, and Sarawak; seemingly widely distributed but local (Tweedie, 1983; Malaysia, Sabah CITES MA, 1985).

Singapore First recorded from Singapore by Blandford, reporting in 1881 on a collection made by Dennys. This record (of a single specimen) seems to be the basis for reports of *curtus* from Singapore made by later authors (such as Ridley, 1899; Flower, 1899; Boulenger, 1912), none of whom appear to have had first hand experience of the species in that country. Sworder (1922), in an annotated list of Singapore snakes, calls into question the accuracy of locality data for many specimens in the Dennys collection; thus there may be an element of doubt over the occurrence of the species in Singapore. However, although no later authentic records can be traced, and recent information is that *curtus* is not in fact present (P. Gopalakrishnakone, *in litt.*, 13 March 1986), the species may have occurred in Singapore in the past.

Thailand Restricted to Changwat Pattani in the extreme southeast (Taylor, 1965; Soderberg, 1965).

Python curtus

Viet Nam Two specimens were reported from near Saigon, southern Viet Nam, by Tirant in 1885. His identification seems justified by the description provided (Campden-Main, 1970), but the distinct possibility has been raised that these were introduced by man - there is an active trade in pythons and other large snakes in the region (Saint Girons, 1972). There have been no subsequent records from Viet Nam, but if the natural range does extend this far to the northeast the species might be expected to occur in *Kampuchea* also although it does not appear to have been recorded (Saint Girons, 1972).

POPULATION No detailed information is available on populations of *P. curtus* anywhere in its range, nor on population trends or the effects of exploitation. The species is generally reported to be less common than *Python reticulatus* in the region.

Brunei No information.

Indonesia No information.

Malaysia Reported not rare in the peninsula at the turn of the century (Ridley, 1899), and not uncommon in peninsular Malaysia in the 1950s (Tweedie, 1983). At Asahan in Malacca, only one *P. curtus* was seen during a period of three and a half years, while *P. reticulatus* was said to be very common (Batchelor, 1958). Among the snakes regularly brought to the University at Bangi, Selangor, there is perhaps one *curtus* to every eight to ten *reticulatus* (G. Davison, *in litt.*, 22 February 1986). In general, not commonly encountered in peninsular Malaysia, but widespread and not heavily exploited (S. Ambu, *in litt.*, 17 February 1986). Here, also said to be not frequently seen, but not markedly uncommon either; the relative frequency of *curtus* to *reticulatus* is about 1:100 (B. Kiew, *in litt.*, 25 February 1986).

Said to be much rarer than *Python reticulatus* (common) in Borneo in the early years of this century; this report apparently refers to Sarawak in particular (Shelford, 1916). No *curtus* were found during long-term herpetological sampling at three primary rainforest sites in Sarawak in 1962-64 and 1984 (R.F. Inger, *in litt.*, 5 March 1985), and none were seen by another fieldworker (working on rainforest lizards) (H. Watson, *in litt.*, 17 March 1986). Similarly, reported less common and less widespread than *P. reticulatus* in Sabah, but suitable habitat is found through most of the country (Malaysia, Sabah CITES MA, 1985).

Singapore No information (see Distribution section above).

Thailand Cited as rare within its very restricted range (Soderberg. 1965).

HABITAT AND ECOLOGY A relatively small and very stout-bodied python, reaching about 2.75 m total length. Preferred habitat variously cited as swampy country (De Rooij, 1917), swamp forest (Bain and Humphrey, 1982), and heavy jungle along watercourses (Reitinger, 1978). In West Malaysia *P. curtus* has been found in the same kinds of habitat as *P. reticulatus*, such as along streams, on the forest floor, and in secondary growth. Nocturnal, spends much time in water, feeds on small vertebrates, reportedly fond of rats (Ridley, 1899; Reitinger, 1978). This last seems confirmed by the fact that 10 out of 11 specimens collected near Kuala Lumpur between 1948 and 1954 were found in rat traps at an experimental trapping area at Sungei Buloh (Lim, 1955). An oviparous species, laying 10-15 eggs which are brooded by the mother until hatching (Reitinger, 1978)

THREATS TO SURVIVAL None adequately documented, although collection for the skin trade may be a serious threat (see below). Reportedly "most of" the

preferred habitat of the species has been destroyed (Bain and Humphrey, 1982); it seems likely that this is intended to refer to Thailand rather than South East Asia in general, although this is not entirely clear. It is further uncertain whether mangrove forest should be regarded as *P. curtus* habitat as is implied by these authors' text, and in any case 'preferred' habitat is not known. The species is certainly much consumed locally, although it is not as popular as the much larger *P. reticulatus* (Irvine, 1954).

Malaysia In Sabah, the Chinese community uses python meat particularly for soup, and occasionally the skins are used for decorative purposes. The levels of exploitation are thought to be low, and capture for the pet trade is thought to be insignificant (Sabah CITES MA, 1985).

INTERNATIONAL TRADE Although *P. curtus* has long figured in the live animal trade, with many specimens being exported through Singapore (Irvine, 1954), CITES reports indicate that a much larger number of animals are now used by the skin trade.

Table 1a Minimum net imports of skins of *P. curtus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Austria	–	–	89	–	–	–
Canada	–	–	–	54 m	–	11750
Finland	–	–	–	217 m	481 m	–
France	–	76 m	1427	2170 m	–	–
German D.R.	–	–	–	8822 m	–	–
Germany, F.R.	–	–	–	2391	655	–
	–	–	–	–	118 m	–
Greece	–	–	13	71 m	–	–
Italy	–	2500 m^2	13910	4571	2544	–
	–	1440 m	7685 m	15732 m	1455 m	–
Japan	–	–	22	–	971 kg	7527
Mexico	–	–	–	–	803 m	–
Netherlands	72	–	–	–	–	–
Spain	–	1189	167	–	58	–
Switzerland	–	4001 m	–	1436	1449	–
Turkey	–	–	–	–	200	–
UK	–	–	222	–	–	–
USA	863	14891	3619	4083	9984	11902
	–	–	3762 m	700 m	15500 m	27393 m
	–	–	–	–	2 kg	–
Total	935	16080	19469	12481	14890	31179
	–	5517 m	11447 m	27766 m	18357 m	27393 m
	–	2500 m^2	–	–	973 kg	–

International trade in *P. curtus* was examined by means of the Annual Reports of Parties to CITES; only trade in live animals and skins being considered. The volume of the skin trade is shown in Table 1a. Some transactions were reported in terms of length, weight or area; it is difficult reliably to convert these to numbers of skins, but as *P. curtus* rarely exceeds 3 m in total length, the mean length of skins in trade is likely to be in the region of 1 m. It must be recognised that this can only lead to an approximation of

Python curtus

Table 1b Minimum net imports of live *P. curtus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Argentina	1	–	2	–	–	–
Austria	–	–	5	2	–	1
Canada	1	–	1	3	6	6
Denmark	4	–	–	–	–	–
Germany, F.R.	127	40	46	16	20	10
Hong Kong	–	–	–	–	–	6
Italy	13	1	8	30	–	–
Japan	–	–	–	16	–	–
Mexico	–	–	4	–	–	–
Neth. Antilles	–	–	–	1	–	–
South Africa	–	–	2	–	3	–
Spain	–	2	–	–	–	–
Switzerland	4	–	10	–	–	–
UAE	–	–	4	–	–	–
UK	52	13	17	5	–	2
USA	157	128	170	69	67	18
Total	359	184	269	142	96	43

Table 2a Reported countries of origin (or exporting country if no origin reported) and quantities of transactions in live animals (L) and skins (S) of *P. curtus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having populations of P. *curtus*						
Indonesia	–	9256	9256	11568	16708	28090
	–	10517 m	3012 m	23948 m	11480 m	27393 m
	–	2500 m^2	–	285 kg	975 kg	–
Malaysia	–	715	–	–	–	–
Thailand	–	–	–	–	1642	–
Countries without wild populations of *P. curtus*						
India	–	8	–	–	–	–
Japan	–	3479	–	–	59	–
Singapore	935	7579	8435 m	1289	272	11359
	–	–	–	8 m	1514 m	–
Unknown	–	2899	24688	906	1642	6
	–	–	–	8822 m	22559 m	–
	–	–	–	–	975 kg	–

the number of individuals involved, but on this basis the volume of trade increased sharply from 935 in 1980 to 58 572 in 1985, ignoring transactions reported by weight or area. The USA, Italy, Japan and Canada were the main importers. The declared sources of the skins are given in Table 2a, from which it appears that Indonesia was the major supplier; it is likely that the large numbers recorded from Singapore also in fact originate from Indonesia.

Table 1b shows the volume of trade in live animals, which declined from 359 in 1980 to only 43 in 1985. The great majority of live snakes originated in Thailand (see Table 2b), until 1984, when Malaysia emerged as the main source.

The sudden and dramatic increase in 1981 in the number of *P. curtus* skins in international trade suggests that trade may be shifting to this species now that its larger congeners are nominally protected in much of their range; reduced availability of other *Python* used by the skin trade may also be a factor, but this cannot be established at present. No data whatsoever are available on population status of this species in Indonesia; this information is required in order to assess the likely impact of the present harvest.

Table 2b Reported countries of origin (or exporting country if no origin reported) and numbers of live *P. curtus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having populations of *P. curtus*						
Indonesia	1	–	–	–	–	–
Malaysia	7	2	2	5	96	43
Thailand	354	185	279	135	–	6
Countries without wild populations of *P. curtus*						
Canada	1	–	–	–	–	–
Germany, F.R.	–	–	1	–	–	–
Ghana	1	–	–	–	–	–
USA	1		–	2	3	
Unknown	–	–	3	2	–	–

CONSERVATION MEASURES The species is largely unprotected by legislation; it does not appear on available lists of taxa covered by conservation legislation in Brunei.

Indonesia Hunting quotas for 1987 were set to total 25 000 skins, divided between the regions as follows: Acoh, 8000; Sumut, 13 000; Sumbar, 2000; Riau, 2000 (Indonesia CITES MA, 1987).

Malaysia Not protected in Peninsular Malaysia, Sabah or Sarawak (E. Bennett, *in litt.*, 5 February 1986).

Singapore All wild fauna in Singapore is fully protected (Singapore Primary Production Department, *in litt.*, 11 January 1986).

Thailand Recently protected in Thailand under the Wild Animals Reservation and Protection Act B.E.2503, effective 11 November 1985.

Python curtus

CAPTIVE BREEDING This species has reportedly proved very difficult to maintain successfully in captivity (Stafford, 1982). There were 38 captive specimens in 18 collections in 1984; no captive breeding recorded (Slavens, 1985), nor in 1979-1981 (Olney, 1984).

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INDIAN PYTHON, ROCK PYTHON

Recommended list: 2
[Possible problem]

Python molurus (Linnaeus, 1758)

Order SERPENTES

Family BOIDAE

SUMMARY AND CONCLUSIONS A large and widespread South and South East Asian python, ranging from Pakistan, Indian, Sri Lanka, Bangladesh and Burma eastward to Hong Kong and southern China (including Hainan), and south through Viet Nam, Kampuchea, and Laos to Thailand, although absent from the Malay Peninsula. Present in Indonesia (Java, Sulawesi, Sumbawa) but reports from Borneo may be in error. Occurs in a variety of habitats, often rather open deciduous woodland, often with rock outcrops, and typically in the vicinity of permanent water. Populations in the Indian sub-continent are assigned to *P. m. molurus*, those from Burma eastward to *P. m. bivittatus*; the former taxon is listed on CITES Appendix I, the latter on Appendix II. Population information is sparse and anecdotal; said to be common in southern Viet Nam, Sri Lanka and possibly Burma, and to be depleted or locally extinct in most of the Indian sub-continent. No data available for most of the range of *P. m. bivittatus*.

Widely used for food and medicinal purposes, particularly by tribal and Chinese-speaking communities. The volume of the international skin trade appears from the CITES reports to have increased from 52 572 in 1980 to 225 923 in 1985. Italy, France, the USA and F.R. Germany were the main importers and Thailand, Indonesia and Viet Nam were the major suppliers. The trade in live animals also showed a dramatic increase, from 4873 in 1981 to 25 255 in 1985. The USA was the major importer and the great majority of live snakes originated in Thailand.

The sustainability of the recent trade cannot be objectively evaluated in the absence of population data; field data on population sizes and trends are required. It must be suspected that present trade is excessive and it appears to be increasing steadily.

DISTRIBUTION Widespread in the Indo-Malayan region. Extends from the Sind region of Pakistan east almost throughout India and across the lowlands of Nepal to Bangladesh, also to Sri Lanka. From the Indian sub-continent the species extends through much of mainland southeast Asia, north into subtropical China and Hong Kong; although apparently absent from the Malay Peninsula, it occurs on Sulawesi, Java, and adjacent smaller islands, and has been reported to occur on Borneo (this may be questionable). As with *Python curtus*, *P. molurus* virtually always lives in the vicinity of water, and its actual distribution must thus be rather patchy within its overall range.

Taxonomic note Populations centred on the Indian subcontinent are assigned to *Python molurus molurus*, Indian Python (Appendix I); populations from Burma (and possibly Nepal) eastwards are assigned to *P. m. bivittatus*, Burmese Python (Appendix II). Smith (1943) states that *molurus* ranges east to Bengal (i.e. including present-day Bangladesh) and that *bivittatus* occurs throughout the 'Indo-Chinese subregion' (in which he includes Nepal and north-east India); however, animals from throughout the sub-continent, including Nepal, are often treated as the nominate form (Stimson, 1969). The south-west Bangladesh population has been referred to *P. m. bivittatus* (Kock and Schröder, 1981). Although many authorities support the use of trinomials, very few specimens from the supposed contact area of *molurus* and *bivittatus*, in north-eastern parts of the Indian subcontinent, have been examined. The distinguishing features of the two taxa are perhaps more clearly expressed in this region than in more distant parts of the range (A. Stimson, pers. comm., 1986).

Python molurus

For comparative purposes, brief information on *P. m. molurus* is given in the Distribution and Population sections, and much of the Habitat and Ecology section is perforce based on the sub-continent, but this taxon is not treated elsewhere in this account.

Appendix I populations: *P. m. molurus*

Bangladesh Formerly widespread through all 21 districts, but now depleted and very restricted in distribution and largely confined to the Sunderbans and evergreen forests of the south-east (Khan, 1982), although the latter may have been *P. m. bivittatus* (Kock and Schröder, 1981).

India Ranges virtually throughout, although reportedly extirpated from many former localities (Whitaker, 1978).

Nepal No records are available from west or east Nepal, the species appears to be restricted to central areas (Swan and Leviton, 1962).

Pakistan Records are restricted to Sind in the south-east, in the Indus delta and lower valley (Minton, 1966) mostly east of the river, northward at least to the Nawabshah district (Pakistan CITES MA, 1986); also in the Tharparkar desert area (Ghalib *et al.*, undated); the species may extend to the Punjab (cited from the Punjab area of pre-partition 'India' by Smith, 1943).

Sri Lanka Occurs widely in the low country, occasionally ascending into the hills (De Silva, 1980).

Appendix II populations: *P. m. bivittatus*

Bangladesh Reported from the CHittagong region (Kock and Schröder, 1981).

Brunei No specific records available, probably present if present at all on Borneo (see under Indonesia).

Burma Records extend south to the Tavoy district (Smith, 1943).

China Occurs in mountain forests in Fujian, Guangdong (including Hainan island), Guangxi, Guizhou and Yunnan (Anon., 1980).

Hong Kong Reported from many parts of the country, most frequently from widely distributed sites on Hong Kong island (Romer, 1979)

Indonesia Present on Java (and adjacent islands east to Sumbawa) and Sulawesi; also reported from Borneo (de Haas, 1950) and may thus occur in Kalimantan, although the species's occurrence in Borneo is doubted by one authority (R.F. Inger, *in litt.*, 5 March 1986).

Kampuchea Widely distributed over most of the country (Saint Girons, 1972).

Laos Reportedly found in all provinces, although more rare than *P. reticulatus* (Deuve, 1970), and more common in the south (Lao P.D.R. Forest Department, *in litt.*, 31 January 1986).

Malaysia There appears to be no confirmed record of the species from any part of Malaysia. The occasional old report exists for west Malaysia, but any such individuals are likely to have escaped from snake charmers (Flower, 1899; Tweedie, 1983). There appear to be no specific records for Sabah or Sarawak; although the species has been reported to occur in Borneo (Smith, 1943; de Haas, 1950), and might thus be expected in Sabah or Sarawak, its occurrence in

Borneo is doubted by one authority (R.F. Inger, *in litt.*, 5 March 1986).

Thailand Recorded from the provinces of Raheng, Lopburi and Chonburi (Smith, 1943); also said to be found throughout the country, except for the southern provinces (Soderberg, 1965).

Viet Nam Widespread in southern Viet Nam although absent from southern parts of the delta (Campden-Main, 1970); no information for the northern half of the country but quite probably similarly widespread.

POPULATION Virtually all information available on population levels or trends is anecdotal in nature; appropriate fieldwork is required to generate some quantitative data.

Appendix I populations: *P. m. molurus*

Bangladesh Uncommon generally but common in the Sunderbans (Khan, 1982; Bangladesh CITES MA, 1986). Widely distributed and present in all 21 districts about three decades ago, but due to habitat changes there have been only two records of sightings outside government controlled forests in the past decade; small populations survive in evergreen forest in the east and good populations remain in the Sunderbans (Khan, 1982).

India Widely distributed but heavily exploited and locally extirpated in many areas (Whitaker, 1978), possibly in most of its former range, remains common in certain locations in Rajasthan, Andhra Pradesh and Uttar Pradesh (and perhaps elsewhere) (Whitaker and Whitaker, 1983); also cited as in severe decline, extremely rare outside protected areas, considered a threatened species (Tikader, 1983).

Nepal Regarded as an endangered species in the Kingdom, but common in the grasslands of Chitwan National Park, in particular at Kans and Dhadi (Dhungel, 1985).

Pakistan Cited as threatened (Ghalib *et al.*, undated). Populations have not yet been surveyed, but they are thought to have been very much depleted (Pakistan CITES MA, 1986).

Sri Lanka Said to be one of the more common snakes of the country (Taylor, 1950), or common in the low country (De Silva, 1980).

Appendix II populations: *P. m. bivittatus*

Burma Pythons (sources do not distinguish between *molurus* and *reticulatus*) appear to be widespread and reasonably common, although were becoming rare in some areas even by the early 1900s (Salter, 1983).

China Said to be rare, except, perhaps, on Hainan (Pope, 1961).

Hong Kong Not common anywhere in the country (Romer, 1979). One source (Hong Kong CITES MA, 1985) estimates a population of between 50 and 200 individuals.

Indonesia No information.

Kampuchea Although not rare, not really abundant, perhaps because of hunting for food or commerce (Saint Girons, 1972).

Laos Reported more rare than *P. reticulatus* (apparently not uncommon) (Deuve, 1970). Both this species and *P. reticulatus* are said to have

declined significantly due to local utilisation and the export trade (Lao P.D.R. Forest Department, *in litt.*, 31 January 1986).

Malaysia No data.

Thailand No details available. Literature records are from lowland areas, which in some cases may not have good snake populations; animal dealers are thought still to obtain specimens (W.Y. Brockelman, *in litt.*, 14 February 1986)

Viet Nam Common in the southern parts (Campden-Main, 1970); no information for the north.

HABITAT AND ECOLOGY A large and lethargic, heavy-bodied, diurnal and nocturnal snake, capable of attaining a total length of around six metres (18-19 ft) (although few, if any, such individuals are likely to exist at present). May be found in a variety of habitats, but appears to prefer wooded areas - ranging from evergreen forest to more open deciduous woodland; known localities often include rock outcrops or hollow trees used for shelter and nesting, and typically will include still or flowing permanent water. The species may also be found in the vicinity of rivers, lakes or marshy areas, often in open semi-arid country, and in reed beds and mangrove stands. An able swimmer, capable of remaining submerged for many minutes, and an able climber, often ascending trees to seek prey or to ambush prey while concealed among branches. Prey includes a wide variety of mammals, birds and reptiles. Although mammals as large as deer, gazelle and leopard have been taken, small mammals - rats in particular - appear to comprise the bulk of the diet (there is growing awareness of their importance as rodent control agents in agricultural areas).

In India, mating occurs during December-February (the colder season); the clutch of 8-100 eggs, about 6 x 12 cm in size, is laid three to four months later, in the hot weather months of March-June. The female incubates the eggs which hatch around 58 days later. Hatchlings may measure near 75 cm and grow rapidly in their first years. Maturity is attained at around five years of age and a little over three metres length. Captive specimens have lived for 22 years.

THREATS TO SURVIVAL This species is used for food by a variety of indigenous peoples throughout its range (Wall, 1912), and has been exported, from India to China for example, for food and medicinal purposes (Irvine, 1954). In the 1950s python meat on sale in Hong Kong was more expensive than beef (Irvine, 1954). Python fat and various organs are often attributed medicinal properties, apparently by Chinese and tribals in particular; the gall bladder is especially prized in parts of Burma for example (Wall, 1912). Local utilisation for food is unlikely to pose a serious threat, but it has been suggested that the extent of demand for medicinal and other purposes in Chinese-speaking areas should be investigated. However, the primary threat is exploitation for the skin trade, which appears to exist, often at an unsustainable level, almost throughout the range of the species.

Bangladesh There is said to be no internal or external trade in this species (Bangladesh CITES MA, 1986).

Pakistan The species was formerly ruthlessly hunted for its skin but this is now illegal (Pakistan CITES MA, 1986).

INTERNATIONAL TRADE This species has long been prominent in the live animal trade, being large, attractive and readily kept in captivity; captive breeding is also relatively straightforward.

Table 1a Minimum net imports of skins of *P. molurus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Australia	–	30	–	33	–	–
Austria	–	160	47	140	336	150
	–	–	–	14 m	–	–
Belgium	–	–	–	–	766	706
	–	–	–	–	248 m	–
Canada	14	–	102	78	16	148
	–	–	–	–	58 m	–
China	839	–	–	–	–	–
Cyprus	–	–	–	38 m	–	–
Denmark	386	–	–	–	–	–
Egypt	–	–	81	–	–	–
France	–	–	–	–	23839	54658
	–	2890 m	–	–	28000 m	7500 m
German D.R.	–	5945	3000 m	–	–	–
Germany, F.R.	11851	21200	671	5701	6247	6807
	–	–	–	–	37945 m	7603 m
	–	–	–	–	–	80 kg
Greece	–	–	1	96	–	545
Hong Kong	10500 m	–	1623	5499	–	3140
Hungary	–	–	–	50	–	7
Israel	–	20	15	34	16	18
Italy	79	5210	13598	22255	7566	62650
	12000 m	7060 m	45477 m	180525 m	80226 m	28414 m
	–	52869 m^2	–	–	–	–
Japan	1847	–	409	5391	4060	18148
	–	–	134 kg	1736 m	1783 kg	–
Korea, Rep. of	–	–	–	–	189	–
Lebanon	–	–	–	10	30	–
Mexico	–	64	–	–	3333	893
	–	–	–	–	396 m	–
Netherlands	–	–	–	1399	726	1394
	–	–	–	–	7000 m	12150 m
New Zealand	–	–	1	15	115	–
Saudi Arabia	–	–	–	30	3	–
Singapore	–	–	–	–	5355	–
South Africa	–	639	1	25	–	24
Spain	–	348	83	15	6855	13858
	–	2200 m	–	–	257 m	–
Sweden	638	–	–	–	–	–
Switzerland	1	2 m	1523	693 m	723	–
Taiwan	–	–	7	–	1080	450
	–	–	–	–	2000 m	–
Turkey	–	–	–	–	22	100
	–	–	–	–	–	583 m
UK	10000 m	16839 m	2136	3737 m	5000 m	–
USA	6411	22320	16850	6204	20769	25372
	19667 m	32341 m	5846 m	4401 m	17453 m	6404 m
	–	–	241 kg	–	96 kg	–
Unknown	–	2260 m	14	–	–	–
Total	22066	55936	37262	46975	82046	189068
	52167 m	63592 m	54323 m	191144 m	178583 m	62654 m
	–	52869 m^2	375 kg	–	1879 kg	80 kg

Table 1b Minimum net imports of live *P. molurus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Argentina	-	-	1	5	-	5
Austria	-	-	73	12	-	14
Belgium	-	-	-	-	40	10
Canada	119	44	21	73	65	79
Czechoslovakia	-	-	-	-	-	15
Denmark	40	-	-	-	388	525
Finland	1	-	5	-	-	-
France	-	13	-	17	9	82
German D.R.	15	-	-	-	6	1
Germany, F.R.	770	598	672	794	700	2001
Greece	-	-	-	1	4	4
Hungary	-	-	-	-	1	-
India	-	-	-	2	-	-
Israel	-	10	-	-	-	-
Italy	28	167	119	160	42	194
Japan	-	-	-	246	326	1182
Korea, Rep. of	-	-	-	-	-	4
Kuwait	-	-	-	-	12	10
Liberia	-	4	-	-	-	-
Mexico	8	-	25	-	-	-
Netherlands	-	-	-	-	601	1762
Poland	-	-	-	2	-	-
Portugal	-	-	-	2	16	112
Qatar	-	-	-	4	-	-
Saudi Arabia	-	-	-	-	3	55
Singapore	-	-	-	-	-	6
South Africa	1	-	-	-	-	-
Spain	-	-	-	15	11	48
Sri Lanka	-	-	-	4	-	-
St Helena	-	-	-	-	-	3
Sweden	-	-	-	6	-	4
Switzerland	109	51	37	-	-	1030
Tunisia	-	-	-	-	1	-
UAE	-	-	2	-	9	-
UK	97	521	798	631	1150	1421
USA	5360	3465	5486	5363	12626	16663
USSR	-	-	-	-	3	25
Unknown	5	-	-	-	-	-
Total	6553	4873	7239	7337	16013	25255

The only reports of international trade in *P. molurus* are those contained in the Annual Reports of Parties to CITES. Most were reported as *P. m. bivittatus*, but a few were simply described as *P. molurus*. Only trade in live animals and skins was considered. The volume of the skin trade is shown in Table 1a. Some transactions were reported in terms of length, weight or area; it is difficult reliably to convert these to numbers of skins, but Fuchs (1975) suggested 1.7 m as the mean length of *P. molurus* skins in trade. It must be recognised that this can only lead to an approximation of the number of individuals involved, but on this basis the volume of trade increased steadily from 52 752 in 1980 to 225 923 in 1985, ignoring transactions reported by weight or area. Italy, France, the USA and F.R.

Germany were the main importers. Some of the apparent increase is artificial, because France, a major importer in 1984 and 1985, did not report imports of Appendix II material before 1984. The declared sources of the skins are given in Table 2a. from which it appears that Thailand, Indonesia and Viet Nam were the major suppliers.

Table 1b shows the volume of trade in live animals, which also showed a dramatic increase, from 4873 in 1981 to 25 255 in 1985. The USA was the major importer, but the UK, F.R. Germany, Japan, Switzerland and the Netherlands also imported significant quantities. Almost all of the live snakes originated in Thailand (see Table 2b).

The effects of the trade cannot be satisfactorily evaluated in the absence of any adequate population data, but the levels must be viewed with concern, particularly as they seem to be increasing steadily.

Table 2a Reported countries of origin (or exporting country if no origin reported) and numbers of skins of P. molurus bivittatus reported to CITES. Transactions reported by length were converted to numbers using an average length of 1.7 m.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having populations of P. m. bivittatus						
China	–	280	–	–	233	–
Hong Kong	–	–	–	–	–	471
Indonesia	1244	11665	4724	19494	10887	3184
Malaysia	104	770	–	–	–	–
Thailand	19772	228772	53500	128321	159451	224315
Viet Nam	28654	25682	7062	27784	17075	1192
Burma	–	–	–	26	–	–
'Asia'	–	–	–	–	1	–
Countries without wild populations						
Argentina	311	92	–	–	–	–
Austria	–	–	–		–	–
Cameroon	–	–	–	–	–	–
Canada	3	–	–	–	–	–
Denmark	–	–	–	–	–	–
Ghana	–	–	–	–	4	–
India	–	4	–	–	–	–
Italy	–	57	–	–	–	–
Japan	–	160	–	–	–	–
Netherlands	1176	–	–	–	–	–
Nigeria	–	–	–	–	27	–
Singapore	5	15334	1731	654	1026	1363
Spain	1	–	–	–	–	–
South Africa	–	3	254	5	–	–
UK	–	–	102	1	–	–
USA	–	–	–	34	–	–
Taiwan	–	–	–	1	1690	–
Venezuela	–	–	6	35	–	–
Unknown	10598	6195	9176	6370	4099	94

Python molurus

Table 2b Reported countries of origin (or exporting country if no origin reported) and numbers of live P. molurus bivittatus reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having populations of P. m. bivittatus						
Burma	-	3	-	-	-	2
Indonesia	-	2	-	-	-	-
Malaysia	-	-	-	2	113	94
Thailand	6508	4847	1464	7334	15935	24903
Viet Nam	-	-	-	-	-	308
'Asia'	-	4	-	-	-	-
Countries without wild populations						
Austria	-	2	1	3	-	1
Cameroon	-	-	-	2	-	-
Canada	-	13	11	-	-	-
Denmark	-	-	-	3	-	-
German D.R.	-	-	-	5	-	-
Germany, F.R.	24	13	3	4	2	1
Guatemala	2	-	-	-	-	-
Poland	-	-	-	-	4	4
South Africa	-	4	-	-	-	-
Switzerland	-	-	-	-	15	10
Togo	-	20	175	-	-	-
UK	-	-	-	-	2	-
USA	1	-	29	-	39	2
Unknown	2	3	3	-	7	3

CONSERVATION MEASURES

Bangladesh The skins of pythons are mentioned in Schedule II of the Wildlife (Preservation) Order, 1973. Their possession, transfer or import requires a certificate of lawful posession.

Hong Kong Listed as Protected under the Wildlife Protection Ordinance No. 5, 1976, and as such hunting, killing and possession is prohibited (Hong Kong CITES MA, 1985).

India Pythons are listed on Schedule I of the Widlife Protection Act, 1972, and are thus totally protected.

Indonesia Protected since 1978 in Indonesia (Indonesia CITES MA, 1986).

Pakistan The species is protected, and may not be killed, trapped or traded (Pakistan CITES MA, 1986).

Thailand Listed on Schedule 2 (protected wild animals of the second category) of the Wild Animals Reservation and Protection Act B.E.2503 in Thailand, effective 11 November 1985.

CAPTIVE BREEDING This species is very commonly held by zoos and pet keepers, and is frequently bred in captivity. A recent inventory (Slavens,

1985) records 77 *P. m. molurus* in 21 collections and 198 *P. m. bivittatus* in 56 collections in 1984; total numbers in captivity will certainly be much higher than these figures. Second generation captive breeding has been recorded at Berlin, Milwaukee, Pilsen and Little Rock zoos (Olney, 1984).

Reportedly reared (though not bred) until of commercially viable size for the skin trade at several crocodile farms in South East Asia, including Singapore (Platt, 1985).

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RETICULATED PYTHON

Recommended list: 2
[Possible problem]

Python reticulatus (Schneider, 1801)

Order SERPENTES

Family BOIDAE

SUMMARY AND CONCLUSIONS A potentially very large species. Widespread in South East Asia from south-east Bangladesh east through Burma, Thailand, Kampuchea and Laos to Viet Nam and south through the Malay Peninsula to Singapore, thence east through much of the Indo-Australian Archipelago and the Philippines. Present in the Nicobar Islands (India). Generally regarded as common, or even very common, around the turn of the century. Little recent information is available but the species is still reportedly common in parts of the range (Malaysia, Thailand, Viet Nam); no information is at hand for most of the range, and no sound data on population status or trends for any part of it. Often a forest species and typically occurs in the vicinity of water. Also present in secondary growth and quite frequently near human settlements, presumably attracted by the availability of chickens and other domestic stock. Females of four metres length typically lay a clutch of 30-40 eggs.

Widely used for food and medicinal purposes, particularly by tribal and Chinese-speaking communities. Heavily exploited by the live animal trade, and very heavily by the skin trade. The volume of the international skin trade appears from the CITES reports to have increased from 166 000 in 1980 to 677 000 in 1985. Italy, the USA and F.R. Germany were the main importers and Indonesia, Thailand and Malaysia were the major suppliers. The trade in live animals also showed a dramatic increase, from 4909 in 1981 to 16 613 in 1985. The USA was by far the major importer and the great majority of live snakes originated in Thailand.

The sustainability of the recent trade cannot be evaluated in the absence of significant population data; such data should be gathered as a matter of priority. It must be suspected that present trade is excessive and it is particularly worrying that it seems to be increasing.

DISTRIBUTION Widespread in the Indo-Malayan region. Extends from south-east Bangladesh eastward almost throughout mainland South East Asia, and south through Peninsular Malaysia to Singapore (Smith, 1943). The range extends across most islands of South East Asia, including most of the Philippines, and most of Indonesia. Also present in the Nicobar Islands (a Union Territory of India).

Bangladesh Restricted to the Chittagong and Sylhet areas (Khan, 1982).

Brunei Recorded as present (Ussher, 1979); no details available.

Burma One source suggests that the species is restricted to southern parts of Burma, but others suggest that pythons (without differentiating between *reticulatus* and *molurus*) are widespread in the country (Salter, 1983).

India Confirmed records appear to be restricted to the Nicobar islands in the Union Territory of the Andamans and Nicobars; recorded from Car Nicobar, Teressa, Trinkat, Nancowry, Great Nicobar and Little Nicobar (Whitaker and Whitaker, 1983). Other sources (Daniel, 1984; Tikader, 1983) state that the species also occurs in mainland India, in the extreme north-east, but these reports seem to be unconfirmed.

Python reticulatus

Indonesia Widespread, west to Sumatra and the adjacent Mentawai group, and east to Halmahera, Seram and Tanimbar (but not to New Guinea) (De Rooij, 1915; de Haas, 1950). Present in Kalimantan, Sulawesi, Java, Flores, Lombok, Natuna, Tanimbar, Sumba and Sumbawa (Indonesia CITES MA, 1986).

Kampuchea There appear to no recent records (Saint Girons, 1972), although the species would be expected to occur throughout (Smith, 1943).

Laos Found in all provinces, although more common in the centre and south (Deuve, 1970).

Malaysia No details available for Malaysia, but apparently occurs in suitable habitat throughout the peninsula (B.H. Kiew, *in litt.*, 25 February 1986); also present in Sabah, where recorded in forested areas throughout (Malaysia, Sabah CITES MA, 1985), and in Sarawak.

Philippines Widespread, including all the larger islands (Leviton, 1963).

Singapore Present (Ridley, 1899), no details available.

Thailand Reportedly restricted to below 18°N (Smith, 1943), although others (Taylor, 1965) regard the species' absence from the north as "possible" or, (Soderberg, 1965), state that it occurs commonly in all provinces.

Viet Nam Occurs throughout southern Viet Nam (Campden-Main, 1970) and extends north through most of the country at least to Yen Bai (near Hanoi) (Smith, 1943). Generally more frequent in the south than the north in Indochina as a whole (Bourret, 1936).

POPULATION The little information available on wild populations, often dating from around the turn of the century, is very generalised or anecdotal in nature. No sound data are available on population levels or trends in any part of the species's range; appropriate fieldwork is required.

Bangladesh While always confined to rain forests in the east and southeast, habitat destruction has reduced and fragmented the range and only two small populations remain, in Sylhet and Chittagong (Khan, 1982). Reportedly common within its restricted range (Bangladesh CITES MA, 1986).

Brunei No data.

Burma No specific data; pythons (both *P. molurus* and *P. reticulatus*) reportedly widespread and reasonable common, although with local declines already noted after the turn of the century (Salter, 1983). Wall (1916) reported that the species was regarded as common in Pegu, not uncommon in Tenasserim (more common than *P. molurus*), but rare in lower Burma generally.

India Restricted distribution, numbers unknown (Whitaker and Whitaker, 1983); officially considered threatened (Tikader, 1983).

Indonesia One early twentieth century source cites this species as very common (De Rooij, 1915), no recent information available.

Kampuchea No data

Laos Both this species and *P. molurus* are said to have declined markedly in Laos due to local utilisation and the export trade (Lao P.D.R. Forest Department, *in litt.*, 14 February 1986).

Malaysia Cited at the turn of the century as one of the commonest snakes, pythons of 6 m (20 ft) then being "by no means uncommon" (Ridley, 1899). Reported very common in the 1950s at Asahan, Malacca (Batchelor, 1958). A recent popular source (Lim, 1981) states that the species is "still quite common", but questions how long this situation will persist. Similarly, said to be still quite common despite exploitation, and can be readily seen (B.H. Kiew, *in litt.*, 25 February 1986). Still abundant in Perlis, within the security area of northern peninsular Malaysia (S. Ambu, *in litt.*, 17 February 1986), but disturbance, habitat loss, persecution and exploitation for food reportedly causes appreciable mortality in other parts of the peninsula, where, by implication, the species may often be less than abundant.

Reported common in Sarawak at one time (Shelford, 1916), and said to be still widespread and common (H. Watson, *in litt.*, 17 March 1986). During intensive herpetological fieldwork at three primary rainforest sites in Sarawak - Nanga Tekalit (366 days), Labang (128 days), Sengai Pesu (160 days) - the *reticulatus* seen numbered only 8, 10 and 4, respectively (R.F. Inger, *in litt.*, 5 March 1986). Population levels unknown in Sabah, although *P. reticulatus* is more common then *P. curtus* (Malaysia, Sabah CITES MA, 1985).

Philippines No data

Singapore Said to be "still far from rare" on Singapore in 1922, when several specimens were captured within Municipal limits (Sworder, 1922), and five individuals were included in a collection of snakes made over seven months, chiefly around the Nee Soon Forest Reserve (Harman, 1961). Apparently still relatively common (P. Gopalakrishnakone, *in litt.*, 13 March 1986), although no details of distribution or abundance are available.

Thailand Said to occur "commonly" in all provinces (Soderberg, 1965). On Phuket Island (Frith, 1977) the species is apparently still common although larger individuals are now very rarely seen because of human predation. Numerous specimens can be seen in the possession of local residents who collect them to sell for skins (Frith, 1977). Seen occasionally in Khao Yai National Park, and more often in Khao Soi Dao in southeast Thailand (in slightly wetter forest); probably present in all evergreen forests and apparently relatively secure (W.Y. Brockelman, *in litt.*, 14 February 1986). At the end of the nineteenth century, said to be very common in the city and suburbs of Bangkok (Flower, 1899); this is presumably no longer the case.

Viet Nam Said to be common throughout the south (Campden-Main, 1970). Half a century ago reportedly not rare in the Indochinese region in general (Bourret, 1936).

HABITAT AND ECOLOGY A potentially very large boid snake, the Reticulated Python is perhaps the only snake which regularly exceeded 6 m in length (Wood, 1982) - enormous old individuals of 8-9 m have been reported on occasion - but the largest specimens living at present are unlikely to approach such sizes, and an 'average' specimen would be perhaps 3-4 m long.

Said to be fond of water, and rarely to be found far from it (Smith, 1943; Tweedie, 1983), the Reticulated Python often occurs in the vicinity of forest rivers and streams, but may also be found around rice fields, and sometimes in water-less rocky hills (Bourret, 1936). In southern Viet Nam, for example, the species is reportedly "always" found near water, and in particular, often found under bridges over rapidly flowing streams (Campden Main, 1970). Whilst the species is said to favour dense forest (Lim, 1981), jungle growth (Soderberg, 1965), or (in Burma) the most dense and least frequented jungle (Wall, 1926), it also occurs in plantations or secondary growth (B.H. Kiew,

in litt., 25 February 1986), and Flower (1899) even stressed that it was once common in Bangkok city and appeared to prefer the busiest parts of the riverside.

The species is said to spend much of the day in hiding, often climbing trees for the purpose, and to seek prey at night, often small or medium sized mammals such as monkeys, civet cats, pangolins, small deer and pigs, but also birds (Lim, 1981; Wall, 1912). Rats, mice, and domestic stock, especially chickens, are taken; for this reason pythons are often found close to human habitation and persecuted as a result.

In captive animals, mating occurs around the turn of the year, with egg laying, a single clutch, usually between April and October (Wall, 1926), about two months after the last mating. Clutch size tends to be greater with increasing size and age of the female; extremes of 8 and 103 have been recorded (Lim, 1981; Reitinger, 1978). Females 4 m in length typically lay 30-40 eggs, about 64 x 118 mm. Pope (1961) cites a report of two nests in Sumatra, one in a hollow log, the other in a hole under bamboo roots. The female coils around the eggs and broods them for the entire incubation period of 2.5-3 months, although she may leave them to drink and slough. Newborn snakes are about 60 cm long. The youngest female known to lay viable eggs was five and a half years old. Captive specimens have a maximum recorded age of 21 years.

THREATS TO SURVIVAL Widely used in South East Asia for food and medicinal purposes, especially by Chinese communities, also by indigenous populations (Ridley, 1899; Irvine, 1954).

Indonesia Python skins are used for leather crafts. Authorised exports of this species were 37 590 in 1981, 67 377 in 1982, 75 775 in 1983 and 170 470 in 1984 (Indonesia CITES MA, 1986). These are considerably lower than imports reported from Indonesia (see Table 2a, below).

Laos Both this species and *P. molurus* are said to have suffered from habitat destruction and hunting for skins and food. The number of pythons used locally as pets may equal those supplying the export trade (Lao P.D.R. Forest Department, *in litt.*, 14 February 1986).

Malaysia There is a low level of local exploitation in Sarawak: each rural village may consume half a dozen pythons (up to 7 m long) each year (J. Caldecott, *in litt.*, 30 January 1986), and there appears to be only one restaurant in Kuching that regularly serves *reticulatus* (E. Bennett, *in litt.*, 5 February 1986). Although the species is caught and eaten or sold whenever encountered in Sarawak, it remains widespread and common (H. Watson, *in litt.*, 17 March 1986). However, large numbers of Reticulated Pythons appear in markets in West Malaysia, and python meat is readily available throughout. The species is also suffering from habitat loss and general persecution as rapid development proceeds. However, there are indications that the demand for python meat has decreased recently, in parallel with an increase in demand for meat, blood and other products of believed medicinal value from venomous snakes (S. Ambu, *in litt.*, 17 February 1986). Other sources (B.H. Kiew, *in litt.*, 25 February 1986) do not regard local exploitation for food in West Malaysia as excessive. In Sabah, the Chinese community uses python meat particularly for soup, and occasionally the skins are used for decorative purposes. The levels of exploitation are thought to be low, and capture for the pet trade is thought to be insignificant (Sabah CITES MA, 1985).

Philippines Permits were granted retrospectively for the capture of 4842 m of *P. reticualtus* skin in 1981, most of which was subsequently exported. A

total of 5 animals were authorised to be captured live from 1981 to 1985 (Philippines CITES MA, 1986).

INTERNATIONAL TRADE The only reports of international trade in *P. reticulatus* are those contained in the Annual Reports of Parties to CITES. Only trade in live animals and skins was considered. The volume of the skin trade is shown in Table 1a. Some transactions were reported in terms of length, weight or area; it is difficult reliably to convert these to numbers of skins, but Fuchs (1975) suggested 1.8 m as the mean length of *P. reticulatus* skins in trade. It must be recognised that this can only lead to an approximation of the number of individuals involved, but on this basis the volume of trade fluctuated between 166 000 and 677 000 from 1980 to 1985, ignoring transactions reported by weight or area. Italy, the USA and F.R. Germany were the main importers. The volume of trade appeared to increase substantially from 1980 to 1984, although the level decreased slightly in 1985. The declared sources of the skins are given in Table 2b. from which it appears that Indonesia, Thailand and Malaysia were the major suppliers.

Table 1b shows the volume of trade in live animals, which also showed a dramatic increase, from 4909 in 1981 to 16 613 in 1985. The USA was by far the major importer, but the UK, Italy and F.R. Germany also imported significant quantities. The great majority of live snakes originated in Thailand, with lesser numbers from Indonesia and, formerly, India.

The sustainability of this volume of exploitation cannot be assessed in the absence of good population data. Exploitation would seem to be excessive and increasing; although the species is said to retain healthy populations in many areas, little is known of populations where exploitation is highest.

Table 1a Minimum net imports of skins of *P. reticulatus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Andorra	–	–	–	19	–	–
Argentina	–	–	–	1852	–	–
Australia	875	9	26	4002	18	–
	–	–	–	82 m	–	–
Austria	–	–	22	85	1051	173
	–	3 m	112 m	184 m	77 m	–
Belgium	–	–	27	28	646	–
	–	–	10885 m	–	875 m	–
Brazil	–	–	–	–	4	55
Canada	1568	4938	474	315	452	202
	561 m	248 m	–	188 m	50 m	–
Cyprus	–	–	45	270	32	–
Denmark	235	233	342	31	45	–
Egypt	–	4	–	–	–	–
Finland	–	–	–	19	3	–
	–	–	–	–	98 m	150 m
France	–	–	–	–	8898	22932
	–	6138 m	–	–	8000 m	2172 m
German D.R.	–	329	7142	–	–	–
Germany, F.R.	–	8009	–	636	–	6976
	55614 m	–	–	50913 m	38494 m	176 m
Greece	–	442	64	113	1654	456
	–	–	–	179 m	3118 m	–
	–	–	–	–	84 m^2	–

Python reticulatus

Table 1a Continued.

	1980	1981	1982	1983	1984	1985
Hong Kong	1576	–	228	250	4766	5911
	–	–	–	3 m	3829 m	–
Hungary	497	–	–	50	–	–
Indonesia	–	–	–	–	–	4 m
Israel	34	71	126	10	39	–
	–	276 m	–	–	22 m	–
Italy	13185	28251	61939	76866	54397	17399
	600 m	4112 m	65570 m	182254 m	61066 m	41855 m
	–	23832 m^2	12 kg	–	–	–
Japan	–	–	–	–	7992	70578
	–	–	–	–	9271 kg	4 kg
Jordan	–	–	–	–	38	–
Korea, Rep. of	–	–	–	–	665	8
	–	–	–	483 m	1851 m	1831 m
Lebanon	105	–	–	–	61	–
Malta	–	550 m	–	–	100	40
Mexico	727	708	629	318	–	6730
	–	7 m	54 m	–	3508 m	2206 m
	221 m^2	44 m^2	24 m^2	–	92 m^2	–
	2 kg	29 kg	329 kg	–	340 kg	743 kg
Morocco	–	–	–	–	–	3
Namibia	–	–	–	–	–	11
Netherlands	–	445	–	–	883	308
	–	–	–	–	2927 m	11760 m
Neth. Antilles	–	–	–	13	–	–
New Zealand	553	700	257	713	1666	–
Norway	20	20	–	–	241	1
Panama	–	–	–	–	–	716
Saudi Arabia	–	–	–	60	–	17
Singapore	–	–	7758	150779	131046	–
South Africa	–	402 m^2	–	–	–	–
Spain	5632	2942	–	–	28307 m	–
Sweden	–	–	–	–	8	10
Switzerland	–	13517 m	1083	501 m	17752 m	–
Taiwan	–	–	–	2757	232	3366
Tunisia	–	–	–	–	71	71
Turkey	–	–	–	55	148	368
	–	–	–	50 m	617 m	104m
UAE	–	–	–	–	77	–
UK	834	5311	1201	–	–	–
	–	15184 m	–	25167 m	21785 m	56915 m
Unknown	1956	2456	665	4	–	–
Uruguay	–	–	–	–	300 m	–
USA	90038	110577	37623	65696	169789	184179
	30429 m	104284 m	39212 m	59087 m	219624 m	300167 m
	1873 kg	97 kg	81 m^2	–	2341 m^2	89 m^2
Venezuela	–	–	–	13	–	–
Total	117835	165445	119651	304954	385022	320510
	87204 m	144319 m	115833 m	322864 m	412300 m	417340 m
	221 m^2	24278 m^2	105 m^2	–	2517 m^2	89 m^2
	1875 kg	126 kg	341 kg	–	9611 kg	747 kg

Table 1b Minimum net imports of live *Python reticulatus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Argentina	2	–	1	–	3	–
Austria	–	4	42	14	18	14
Belgium	–	–	–	–	–	10
Canada	126	48	19	29	58	40
Czechoslovakia	–	–	–	–	–	10
Denmark	59	–	–	–	70	110
Egypt	–	–	–	4	–	–
Finland	–	–	–	–	1	–
France	–	6	4	12	19	82
German D.R.	20	–	–	14	4	2
Germany, F.R.	1022	26	405	660	671	1609
Greece	–	–	–	1	432	2
Hong Kong	–	–	–	–	15	–
Israel	–	10	–	2	–	2
Italy	41	52	118	151	74	36
Japan	–	–	–	156	144	1077
Korea, Rep. of	–	–	–	4	2	–
Kuwait	–	–	–	–	14	8
Liberia	–	2	–	–	–	–
Mexico	2	–	11	–	–	–
Netherlands	–	–	–	–	2550	872
Portugal	–	–	1	–	15	126
Romania	2	–	–	–	–	–
Saudi Arabia	–	–	2	1	–	10
Singapore	–	–	–	1	–	1
South Africa	–	–	–	–	–	1
Spain	–	5	6	10	–	–
Switzerland	95	93	22	8	–	496
Taiwan	–	–	–	1	–	–
UAE	–	–	–	–	1	–
UK	116	284	355	466	1090	1151
USA	5841	4377	4342	4738	6713	10849
USSR	13	–	–	4	2	6
Unknown	–	–	–	1	–	99
Uruguay	–	2	–	–	–	–
Venezuela	–	–	2	–	–	–
Total	7339	4909	5330	6277	11896	16613

Table 2a Reported countries of origin (or exporting country if no origin reported) and numbers of skins of *Python reticulatus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having wild populations of *P. reticulatus*.						
India	21	510	–	900	900	3971
	–	1334 m	1000 m	–	254 kg	–
	–	1000 m^2	–	–	40 m^2	–
Indonesia	13811	72646	68404	242922	265639	176849
	5329 m	55248 m	56975 m	–	203441 m	273355 m
	254 m^2	15333 m^2	–	–	2433 m^2	–
	2 kg	125 kg	–	–	8447 kg	370 kg

Python reticulatus

Table 2a Continued.

	1980	1981	1982	1983	1984	1985
Malaysia	19069	2771	14	2751	4642	3775
	–	150 m	–	–	–	–
	–	29 kg	213 kg	–	221 kg	271 kg
Philippines	497	1435	188	2144	480	2198
	286 m	3069 m	600 m	–	1362 m	5349 m
	–	500 m^2	–	–	–	–
Singapore	37702	62104	26535	36452	8754	90746
	37535 m	55083 m	20745 m	–	712 m	918 m
	–	800 m^2	125 kg	–	84 m^2	–
Thailand	36717	88025	31146	116110	119690	134959
	37954 m	49115 m	32172 m	–	86368 m	135431 m
	–	6796 m^2	24 m^2	–	52 m^2	89 m^2
	–	–	116 kg	–	878 kg	75 kg
Viet Nam	–	–	207	690	441	4 kg
Countries without wild populations of *P. reticulatus*.						
Argentina	–	–	–	15	4	56 kg
Canada	–	–	–	–	–	520 m
Cameroon	–	2	–	–	–	–
Chad	–	–	–	–	–	500 m
China	–	–	–	–	160	–
Denmark	–	–	–	–	1	8
France	–	–	–	630	100	–
German D.R.	170	–	–	–	–	–
Germany, F.R.	9447	3972	–	–	–	–
	–	12001 m	–	–	–	–
Italy	4	–	–	–	–	–
Japan	873	1066	–	1212	8341	1
	5000 m	251 m	329 m	–	215 m	–
	–	–	–	–	77 kg	387 kg
Nepal	–	–	–	1265	–	–
Netherlands	1179	–	–	–	–	–
Nigeria	1740	66	3	–	–	5
	–	61 m	–	–	–	–
Panama	–	–	–	–	77	707
Paraguay	–	–	–	7	–	–
South Africa	1718	1055	23	471	–	–
	–	1623 m	–	–	–	–
	–	31 m^2	–	–	–	–
Spain	2	–	–	–	–	–
Sudan	–	–	–	1	–	104
Switzerland	–	259	23	–	8	–
	–	466 m	–	–	–	–
Taiwan	100	18	18	1654	807	202
	–	4074 m	–	–	–	–
Tanzania	23	–	–	–	–	–
Togo	–	–	–	466	–	–
UK	16	334	–	226	66	18
	1720 m	891 m	–	–	–	–
USA	–	350	–	13	49	8
Unknown	28509	21607	32461	57121	16853	3122
	4380 m	6257 m	13832 m	–	133034 m	2077 m
	37 m^2	–	104 m^2	–	–	–
	1873 kg	–	15 kg	–	–	–

Table 2b Reported countries of origin (or exporting country if no origin reported) and quantities of transactions in live *Python reticulatus* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having wild populations of *P. reticulatus*.						
Burma	-	-	-	-	-	1
Indonesia	-	9	-	4	1880	300
India	1878	-	-	-	-	-
Malaysia	513	161	37	101	449	114
Philippines	-	-	-	1	1	3
Singapore	-	-	5	-	-	-
Thailand	6346	4518	5255	5771	9619	15751
Countries without wild populations of *P. reticulatus*.						
'Asia'	-	4	-	-	-	-
Australia	4	-	-	-	-	-
Canada	1	1	2	-	-	-
German D.R.	-	-	-	2	-	-
Germany, F.R.	10	4	-	4	4	-
Ghana	-	176	25	400	-	503
Guyana	1	-	-	-	-	-
Honduras	2	-	-	-	-	-
Japan	-	-	-	2	-	-
Netherlands	12	-	1	-	-	-
Poland	-	-	-	-	10	-
Sweden	-	-	-	-	1	-
Switzerland	1	-	-	-	15	7
Togo	-	75	25	10	-	294
UK	-	2	-	-	-	-
USA	2	-	22	-	27	1
USSR	-	-	-	-	2	-
Unknown	475	5	15	19	5	1

CONSERVATION MEASURES

Bangladesh The skins of pythons are mentioned in Schedule II of the Wildlife (Preservation) Order, 1973. Their possession, transfer or import requires a certificate of lawful posession.

India Pythons are listed on Schedule I of the Widlife Protection Act, 1972, and are thus totally protected.

Indonesia Harvest is "controlled" in Indonesia (Indonesia CITES MA, 1986). Quotas for 1987 were set to total 140 000 skins, divided between the regions as follows: Acoh, 6900; Sumut, 11 500; Sumbar, 4100; Riau, 8000; Jambi, 6000; Bengkulu, 7000; Sumsel, 12 000; Lampung, 4500; DKI, 2400; Jabar, 1000; Jateng, 100; Jatim, 1000; Kalteng, 17 000; Kalsel, 7000; Kaltim, 30 000; Sulut, 2500; Sulteng, 1000; Sulsel, 10 000; Sultera, 1500; NTT, 500; Timtim, 500; Maluku, 2500; Irja, 3000 (Indonesia CITES MA, 1987).

Malaysia Protected in Peninsular Malaysia (1972 Protection of Wild Life Act) but not in Sabah or Sarawak (E. Bennett, *in litt.*, 5 February 1986).

Python reticulatus

Singapore All wild fauna in Singapore is fully protected (Singapore Primary Production Department, *in litt.*, 11 January 1986).

Thailand Recently protected in Thailand under the Wild Animals Reservation and Protection Act B.E.2503, effective 11 November 1985.

CAPTIVE BREEDING Widely held in public and private zoological collections; a recent inventory (Slavens, 1985) reports 105 individuals in 40 collections. Has bred quite frequently in captivity, in four zoos in 1981, with second generation breeding at Pilsen, Czechoslovakia (Olney, 1985).

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AFRICAN PYTHON

Recommended list: 2
[Possible problem]

Python sebae (Gmelin, 1789)

Order SERPENTES

Family BOIDAE

SUMMARY AND CONCLUSIONS A potentially very large species, very widespread in Africa south of the Sahara. Records exist for the following countries: Angola, Benin, Botswana, Burkina, Burundi, Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Ivory Coast, Kenya, Liberia, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zimbabwe, Zaire, Zambia. The species is also likely to occur in Mauritania. Typically found in the vicinity of water and in savanna habitats but also ranges into forest regions. Seemingly still common in national parks and similar protected areas in southern parts, possibly in the north also, but also reported to be locally depleted, although little information is available on population sizes or trends.

Widely exploited for food, medicine and skins; no detailed information is available on numbers utilized nationally. Relatively small numbers of live *P. sebae* are in reported international trade, an annual mean of 465 animals between 1980 and 1985, but large numbers of skins are traded, ranging between 641 and 15 260 in the same period, with an annual mean of 4403. In the skin trade, the main importers were Italy and F.R. Germany, and the major sources, Sudan, Nigeria, Ghana and Togo. The chief importers of live animals were the USA and F.R. Germany, who obtained stock mostly from Ghana, Togo and Senegal.

This volume of trade seems unlikely to pose a threat to the species as a whole, but, although it may well be adversely affecting local populations, adequate population data are not available to evaluate this possibility; such data should be gathered as a matter of priority.

DISTRIBUTION Widespread in the continent of Africa, south of the Sahara. Present on a few offshore islands, such as Bioko, (Fernando Poo) and Zanzibar, but absent from Madagascar. The northern limit of the range extends from Senegal in the west, across the fringes of the Sahel to Ethiopia and Somalia. The species is absent from the Kalahari and other arid parts of southern Africa, where the southern limit extends from the northern sector of Namibia, across northern Botswana, to north-east South Africa.

Records exist for the following countries: Angola, Benin, Botswana, Burkina, Burundi, Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Ivory Coast, Kenya, Liberia, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zimbabwe, Zaire, Zambia. The species is also likely to occur in Mauritania.

Taxonomic note A recent review (Broadley, 1984) recognises two subspecies, *P. s. sebae* in northern parts of the range, and *P. s. natalensis* in southern parts, from northern Angola, southern Zaire and Kenya south to Natal. A recently described species *P. saxuloides* Miller & Smith, 1979 is reduced to the synonymy of *P. s. natalensis*.

Angola *P. s. sebae* has been recorded from Ambriz and Dundo in the north of Angola. *P. s. natalensis* occurs in the south of the country (Broadley, 1984).

Benin *P. s. sebae* is recorded only from Zizonkame (Broadley, 1984).

Botswana Recorded localities for *P. s. natalensis* are Kasane, Khwai, Lake Ngami, Maun, Metsimaklaba (Broadley, 1984).

Burkina Recorded localities for *P. s. sebae* are Natiaboani, Ougarou (Broadley, 1984).

Burundi *P. s. natalensis* is recorded only from Bujumbura (Broadley, 1984).

Cameroon Recorded localities for *P. s. sebae* are Bafout, Banjo Bamendo, Bipindi, Edea, Koum, Libamba-Makak, Metet, Mieri, Nachtigal, Tcholliré, Victoria (Broadley, 1984).

Chad *P. s. sebae* is recorded only from Sar (Broadley, 1984).

Congo Broadly (1984) recorded *P. s. sebae* only from Nganchou, but it is said to be widely distributed (Congo CITES MA, 1986).

Equatorial Guinea Recorded localities for *P. s. sebae* are Rio Benito on the mainland and Bioko (Broadley, 1984).

Ethiopia Recorded localities for *P. s. sebae* are Amba Aradam, Godare, Kaalam, Sodu (Broadley, 1984).

Gabon Distributed more or less uniformly throughout the country (Gabon Ministère des Eaux et Forêts, *in litt.*, 29 November 1985). Recorded localities for *P. s. sebae* are Belinga, Fernan Vas, Franceville, Omboué, Talagouga (Broadley, 1984).

Gambia Listed as present (Hakansson, 1981).

Ghana Recorded localities for *P. s. sebae* are Abonu, Accra, Achimota, Akosombo, Amisano, Asempanaye, Bolgatanga, Dabacrom, Gbefi, Kete Krakye, Kpong, Kumasi, Legon, Mole National Park, Secondi, Suhum, Tamale, Volta River, Wa (Broadley, 1984).

Guinea Recorded localities for *P. s. sebae* are Conarky, Mont Nimba (Broadley, 1984).

Guinea Bissau Recorded localities for *P. s. sebae* are Bijagos Archipelago, Bissao, Mansoa (Broadley, 1984).

Ivory Coast Recorded localities for *P. s. sebae* are Adio, Podoumé, Bouna, Elima, Flampleu, Lampto (Broadley, 1984).

Kenya The species occurs in a variety of habitats from semi-desert to swamp and forest, occasionally appearing near the centre of Nairobi (A.D. Mackay, *in litt.*, 26 March 1986). *P. s. sebae* has been recorded from several localities in southern Kenya, where it appears to intergrade with *P. s. natalensis* (Broadley, 1984).

Liberia Said to be restricted to swamps and river courses (Liberia CITES MA, 1986). Recorded localities for *P. s. sebae* are Du River, Harbel, Monrovia, Mount Coffee, Peahtah, Robertsport, Suococo (Broadley, 1984).

Malawi Recorded localities for *P. s. natalensis* are Chibotela, Chipoka, Kondowe to Karonga, Lujeri Estate, Misuku Hills, Nyungwe (Broadley, 1984). Morgan-Davis *et al.* (1984) remarked that large individuals could be seen on the Shire River south of Mvuu.

Mali *P. s. sebae* is recorded only from Bamako (Broadley, 1984).

Mauritania There are no records from the country, but *P. s. sebae* has been recorded from three localities on the southern bank of the Senegal River (Broadley, 1984).

Mozambique Widely distributed near permanent water (Mozambique CITES MA, 1986). Recorded localities for *P. s. natalensis* are Alves de Lima, Moçambique Island, Monzo, Setache Po, Vamizi Island and Zinave (Broadley, 1984).

Namibia Recorded localities for *P. s. natalensis* are Kaokoveld to Etosha Pan, Rundu (Broadley, 1984). Said to be widespread in the north of the country, often associated with artificial water points (Namibia Department of Agriculture and Nature Conservation, *in litt.*, 1987).

Niger *P. s. sebae* is recorded only from 11 km north-west of Niamey (Broadley, 1984).

Nigeria Found throughout the country (Nigeria CITES MA, 1987). Recorded localities for *P. s. sebae* are Bamendo, Lagos, Mundame, Samaru (Broadley, 1984).

Rwanda Recorded localities for *P. s. sebae* are Lac Ihema, Ngarama, Parc National Kagera (Broadley, 1984).

Senegal Recorded localities for *P. s. sebae* are Bakel, Boughari, Dagana, Darou, Diattacounda, Fatick, Rossombo, Rufisque (Broadley, 1984).

Sierra Leone Recorded localities for *P. s. sebae* are Bo, Sandaru (Broadley, 1984).

Somalia Recorded in Middle Shebelle, Mogadishu, Bay, Lower Shebelle, Gedo, Middle Jubba and Lower Jubba (Simonetti and Magnoni, 1986).

South Africa *P. s. natalensis* is widely distributed in Natal, Transvaal and Transkei, and reaches the extreme north of the Cape Province. The last specimen was captured in the Eastern Cape Province in 1927 (Fitzsimmons, 1962; Broadley, 1984), but 31 were reintroduced to a nature reserve in the region between 1980 and 1986 (South Africa CITES MA, 1987).

Sudan Recorded localities for *P. s. sebae* are south of Khartoum, Torit and the White Nile (Broadley, 1984).

Swaziland Recorded localities for *P. s. natalensis* are Groenpan Farm, Hlane, Mliba (Broadley, 1984).

Tanzania Said to be widespread (K. Howell, *in litt.*, 15 March 1986). *P. s. sebae* has been recorded from several localities in northern Tanzania, where it appears to intergrade with *P. s. natalensis* (Broadley, 1984). Present on Zanzibar Island but probably not on Pemba (Pakenham, 1983).

Togo Recorded localities for *P. s. sebae* are Binaparba, Nagarou (Broadley, 1984).

Uganda Said to be ubiquitous except at higher altitudes and in arid eastern regions (Pitman, 1974). *P. s. sebae* was recorded only from the Sese Islands by Broadley (1984).

Zaire *P. s. sebae* has been recorded from numerous localities in north, west and central Zaire, including the northern end of the Rift Valley. *P. s. natalensis* occurs in the south of the country (Broadley, 1984).

Zambia Recorded localities for *P. s. natalensis* are Chipangali, Chipata, Chipopera, Kabompo, Kabwe, Kafue River, Kaputa, Kasama, Kasauta, Livingstone, Lusaka West, Mbala (Broadley, 1984).

Zimbabwe *P. s. natalensis* is found throughout Zimbabwe, but is usually most plentiful along major rivers and reed-fringed lakes (Broadley and Cock, 1975). Broadley (1984) listed numerous localities.

POPULATION The southern subspecies is said to be "still common in thinly populated areas where there is good cover and an adequate food supply" (Broadley, 1983); this general situation is also likely to apply to the northern subspecies. In many cases such areas are likely to be in National Parks, Game Reserves, and similar protected areas. In general the species is under pressure due to habitat loss and killing for the skin trade. Although python populations are said to be rapidly declining in many parts of Africa (Madsen *et al.*, 1985), the species is also said to be very common in many regions, and to adapt readily to disturbed environments such as sugar cane fields (and to be found frequently around human habitation) (Branch and Hacke, 1980). Most sources do agree that very large specimens are now rarely seen. Given the widespread exploitation of the species and the concern in some quarters for its population status, appropriate field data are required with some urgency. Available status information is summarised below; there is no information for the other countries.

Cameroon No surveys have been carried out, but the species is said to be not in danger (Cameroon CITES MA, 1987).

Gabon Said to be more common in the coastal regions than inland, where it has been depleted by exploitation (Gabon Ministère des Eaux et Forêts, *in litt.*, 29 November 1985).

Kenya The species is often quite common, although seldom seen (A.D. Mackay, *in litt.*, 26 March 1986). Fairly common along the Kora River in the Kora Game Reserve (Madsen *et al.*, 1985).

Malawi Morgan-Davis *et al.* (1984) remarked that the species must be more common in Lilondwe National Park than the single record would suggest.

Namibia Described as widespread in the north and fairly abundant in Etosha (Namibia Department of Agriculture and Nature Conservation, *in litt.*, 28 February 1987).

Nigeria Described as rare and vulnerable (Nigeria CITES MA, 1987).

Somalia Populations are said to have been sadly depleted owing to hunting and habitat destruction. In Juba and Shebelle they are rather rare an represented almost entirely by young specimens (Simonetti and Magnoni, 1986). Fagotto (1985) described the species as "not rare".

South Africa Listed in the South African Red Data Book as vulnerable outside game reserves, but said to be common in Kruger N.P. (McLachlan, 1978) and in several of the larger Zululand reserves (South Africa CITES MA, 1987).

Tanzania Perhaps not threatened in Tanzania, despite trade in skins (both legal and illegal) and persecution (K. Howell, *in litt.*, 15 March 1986).

Uganda Said to be locally common in suitable habitat, particularly on Victoria and Nyanza Islands (Pitman, 1974). Described as quite common in the extensive swamps of Lake Kyoga and Bunyoro-Luwero areas, although population size is unknown (Uganda Game Department, *in litt.*, 28 March 1987).

Python sebae

Zaire Seemingly under heavy pressure in Zaire due to exploitation for food and skins: pythons were difficult to find within about 30 km of Kinshasa and specimens over 4 m long were not found at all (larger skins on sale may have been stretched or have originated from the interior of the country) (Van Wallach, *in litt.*, 22 October 1983).

Zimbabwe Reportedly common in most National Parks and Safari Areas in Zimbabwe (Broadley and Blake, 1979; cited by Broadley, 1983).

HABITAT AND ECOLOGY A large and heavy-bodied species; at present a snake of 4.5 m would be classed as large but occasional old specimens of 7-8 m have been recorded in the past.

Mainly nocturnal or crepuscular, although not exclusively. Highly aquatic, a strong swimmer, and a good climber. May occur in various vegetation types. Whilst deserts and truly arid regions are avoided, the species is most commonly associated with savanna habitats (or 'bush country') of various kinds, and when present in forest regions it appears to prefer clearings within them, and is often found around human habitation and cultivations (Pope, 1961). Most frequently found near swamps, rivers or other permanent water sources, but can also be common elsewhere. Often found in large horizontal rock crevices near streams, among large boulders in rock outcrops, and in ant-bear burrows or deserted termitaria. Extends up to 2250 m in Uganda (Pitman, 1974).

The diet is varied; any mammal of appropriate size (ranging from rats to antelopes of several species) or bird, may be taken, or occasionally reptiles, frogs or fishes (Broadley and Cock, 1975). Prey is typically taken from ambush; for example, in cover next to a game trail, on a branch overhanging it, or partly submerged at the edge of a water hole (Broadley and Cock, 1975).

Breeding may occur at any time of year in equable humid conditions, but apparently does not occur during dry seasons elsewhere. Clutch size is often between 30 and 50, sometimes more, exceptionally to 100; about 40 is usual for a female of about 4.5 m (14-15 ft) length (Cansdale, 1961). Eggs are about 6 x 9 cm (often many in a clutch being infertile) and are frequently laid in an antbear hole, or similar situation (Broadley and Cock, 1975). Incubation period is about 90 days; the female broods the eggs (assisting maintenance of suitable temperature and moisture conditions), but leaves them frequently to visit water. Hatchlings are 20-22 in (51-56 cm) long and 3 oz (85 g) in weight (Cansdale, 1961). First mating in a captive group was at nearly six years age, 2.4 cm length.

THREATS TO SURVIVAL This species is used for food, medicinal purposes and skins, probably throughout its range. The fat is applied to ease muscle pain and chest complaints, and various internal organs are used for other medicinal purposes. In many parts of Africa, Pythons are revered for spiritual reasons, and are therefore not interfered with (Fitzsimmons, 1962). In West Africa generally, *P. sebae* is most commonly taken for its skin. Also widely persecuted for its alleged threat to domestic stock such as chickens, goats and calves, and thus greatly depleted in settled and farming areas (Broadley, 1983).

Botswana A few pythons are killed for the protection of livestock. There are no legal exports (Botswana CITES MA, 1986), though a few manufactured products are exported.

Cameroon There is little trade in raw skins, but a fairly intense trade in manufactured goods, such as bags, wallets, etc. (Cameroon CITES MA, 1987).

Congo Some tribes in the Congo region are said to relish the meat of pythons (Fitzsimons, 1962). They are also hunted for their skins (Congo CITES MA, 1986).

Gabon The people of the inland regions are fond of python meat, but it is not eaten in coastal districts. There is said to be little internal trade and no recorded exports in 1984 and 1985 (Gabon Ministère des Eaux et Forêts, *in litt.*, 29 November 1985).

Liberia Although the species is used for food, commercial exploitation for skins is the primary form of exploitation (Liberia CITES MA, 1986).

Mozambique There is thought to be little trade, although some animals are killed out of fear and their skins may be traded (Mozambique CITES MA, 1986).

Namibia There is said to be no commercial exploitation and little illicit exploitation by reptile fanciers. Occasionally persecuted by farmers (Namibia Department of Agriculture and Nature Conservation, *in litt.*, 1987).

Nigeria Pythons are commonly killed for their skins. A 5- to 6-m skin can fetch 100 naira ($150) or more; skins are openly sold to tourists on beaches and in hotels in all major cities (Butler and Shitu, 1985).

Sierra Leone Pythons are rarely caught for food but more often for skins, particularly for export. Skins are sold to trophy dealers who retail them to tourists. They are also used by local citizens for house decorations (Sierra Leone Ministry of Agriculture and Forestry, *in litt.*, 23 March 1987).

Somalia Hunting and habitat destruction are both implicated in population decline. Most riverine forest, one of the former main habitats, has now disappeared, and smuggling of python skins is said to be still thriving (Simonetti and Magnoni, 1986). Fagotto (1985) described the species as "not rare".

Uganda Greatly persecuted for skins in Lake Kyoga and Bunyoro-Luwero areas. Used for food in East Madi and possibly West Nile as a whole. From 1981 to 1986 legal exports of skins amounted to 63 in 1981, 16 in 1982, 15 in 1983 and 5 in 1985. Single live animals were exported in 1984 and 1986. There is also thought to be a substantial illegal trade; 142 skins bound for Lebanon were seized in 1986 (Uganda Game Department, *in litt.*, 28 March 1987).

INTERNATIONAL TRADE CITES Annual Reports record trade in skins in numbers of pieces and by length. Transactions reported in terms of length have been converted to numbers of skins using the figure of 1.7 m given as the mean length of skins of *P. molurus* in trade (a similar sized species to *P. sebae*) by Fuchs (1975). These data are summarised in Tables 1 and 2. Relatively small numbers of live *P. sebae* are in reported international trade, an annual mean of 465 animals between 1980 and 1985, but large numbers of skins are traded, ranging between 641 and 15 260 in the same period, with an annual mean of 4403. In the skin trade, the main importers were Italy and F.R. Germany, and the major sources, Sudan, Nigeria, Ghana and Togo. The chief importers of live animals were the USA and F.R. Germany, who obtained stock mostly from Ghana, Togo and Senegal. This volume of trade seems unlikely to pose a threat to the species as a whole, but, although it may well be adversely affecting local populations, adequate population data are not available to evaluate this possibility.

Table 1 Minimum net imports of live animals (L) and skins (S) of *P. sebae* reported to CITES.

	1980	1981	1982	1983	1984	1985
Australia	2 S	–	–	–	1 S	–
Austria	–	–	1 S	–	–	281 L
Belgium	–	–	4 L	1 S	–	1 S
Canada	19 L	1 L	1 L	–	–	8 L
	25 S	–	–	96 S	30 S	13 S
Chile	–	–	–	–	1 S	–
Cyprus	–	–	–	–	–	100 S
Czechoslovakia	–	–	–	1 L	–	–
Denmark	–	–	–	5 L	4 L	–
	–	–	–	1 S	1 S	
German D.R.	14 L	–	–	–	8 L	–
Germany, F.R.	97 L	29 L	187 L	81 L	–	44 L
	1 S	137 S	32 S	335 S	2 S	548 S
France	4 S	1 L	2 L	14 L	3 L	2 L
	–	–	–	–	55 S	7 S
Greece	–	–	–	1 L	6 L	887 S
Israel	1068 S	21 S	–	131 S	–	88 S
	–	–	–	–	–	1 L
Italy	1 L	50 L	40 L	35 L	24 L	–
	–	11553 S	5754 S	–	162 S	148 S
Ivory Coast	–	–	–	15 S	–	–
Japan	–	2 L	2 L	1 S	2 L	21 L
Korea, Rep.	–	–	–	–	4 L	–
Lebanon	–	–	–	10 S	–	–
Liberia	–	–	–	3 S	–	–
Lybia	–	–	–	–	–	3 S
Malaysia	–	–	–	–	2 L	–
Netherlands	–	–	1 L	26 L	18 L	5 L
	–	–	–	–	100 S	–
Philippines	–	–	–	2 L	–	–
Poland	–	–	1 S	–	–	–
Romania	1 L	–	–	–	–	–
Saudi Arabia	–	–	–	2 L	3 L	19 S
Singapore	–	–	–	38 S	6 S	–
Spain	–	1 L	–	1 L	3 L	–
	–	–	–	1 S	–	–
Sweden	–	–	1 S	–	–	1 S
Switzerland	3 L	6 L	9 L	9 L	1 L	4 L
	4 S	–	3 S	34 S	3 S	17 S
Thailand	–	–	–	–	–	59 S
UAE	–	–	–	–	–	69 S
UK	84 L	–	45 L	6 L	7 L	44 L
	–	–	50 S	–	1 S	73 S
USA	315 L	261 L	197 L	81 L	108 L	547 L
	46 S	3549 S	401 S	128 S	279 S	258 S
USSR	–	–	–	1 L	–	2 S
Yemen	–	–	–	–	–	1 S
Yugoslavia	–	–	–	–	–	15 S
Zaire	1 L	–	–	–	–	–
Country unknown	1 L	–	51 S	–	–	–
TOTAL	536 L	351 L	488 L	265 L	193 L	958 L
	1127 S	15260 S	6294 S	727 S	641 S	2369 S

Table 2 Reported countries of origin (or exporting country if no origin reported) and numbers of live animals (L) and skins (S) of *P. sebae* reported to CITES.

	1980	1981	1982	1983	1984	1985
Countries having or possibly having wild populations of *P. sebae*						
Benin	–	–	–	–	50 S	62 S
Cameroon	–	3 S	2 S	7 S	1 S	11 S
Chad	–	430 S	–	–	–	–
Congo	–	1 S	–	–	–	–
Ghana	317 L	145 L	190 L	70 L	30 L	702 L
	2 S	35 S	185 S	38 S	4 S	–
Guinea	–	–	–	–	2 S	10 S
Ivory Coast	–	1 S	–	–	–	5 S
Kenya	167 L	106 L	1 S	3 S	–	1 S
Liberia	–	24 L	7 L	42 L	22 L	40 L
	–	420 S	–	–	2 S	–
Malawi	2 S	–	–	–	–	1 S
Mali	–	–	335 S	–	140 S	2 S
Mozambique	–	–	–	–	1 S	–
Nigeria	210 S	391 S	84 S	656 S	153 S	413 S
Senegal	2 L	–	150 L	–	–	100 L
	3 S	135 S	–	33 S	109 S	–
Sierra Leone	–	–	–	–	7 S	3 S
South Africa	2 S	–	32 S	–	2 S	–
Sudan	–	11308 S	5695 S	7 S	–	1660 S
Tanzania	2 S	1 S	–	–	–	2 S
Togo	45 L	77 L	149 L	95 L	136 L	116 L
	–	–	2 S	43 S	87 S	147 S
Uganda	–	–	20 S	–	–	–
Zaire	1 S	1 S	3 S	57 L	–	41 S
Zambia	2 S	–	–	–	1 S	–
Countries without wild populations of *P. sebae*.						
Austria	–	1 S	–	–	–	–
Germany, F.R.	–	–	–	–	8 L	–
India	1 S	–	–	–	–	–
Indonesia	2 S	–	–	–	–	–
Jamaica	–	–	–	1 S	–	–
Spain	2 S	–	–	–	–	–
Switzerland	–	–	–	39 L	–	1 L
	–	–	–	1 S	–	1 S
Thailand	6 L	2718 S	–	–	–	–
UK	1 L	–	–	–	–	–
Unknown	6 L	–	–	4 L	1 L	–
	904 S	39 S	21 S	21 S	161 S	20 S

Python sebae

CONSERVATION MEASURES Unless otherwise stated, all of the information on protection is from IUCN Environmental Policy and Law Occasional Paper No. 3, *African Wildlife Laws*.

Angola All Pythons are protected under the Hunting Regulations, 11 December 1955.

Benin Under the Decree concerning hunting and capturing licences, bag limits and professional hunters, 11 February 1980, Pythons are designated as small game species. They may only be hunted by the holders of traditional hunting rights or under hunting permits.

Botswana Pythons are totally protected under the Fauna Conservation Act, 1961.

Burkina *Python sebae* is partially protected under the Wildlife Conservation and Hunting Act, 31 December 1968, which establishes bag limits and close seasons, protects nests and eggs, and regulates the sale of meat. Commercial capture and export are controlled under the same Act by Decree No 68-314. Ordonnance No 68-58, December 1985, fixed the open season from 15 December 1985 to 28 February 1986 and stipulated that partially protected species could only be hunted under special permit and only in the province of Gourma and Tapoa.

Burundi No information.

Cameroon *Python sebae* is partially protected (Class B) under the Forests, Wildlife and Fisheries Act, 27 November 1981. They may only be taken under a valid hunting licence. No more than two animals may be taken in one day.

Central African Republic The Ordinance concerning the protection of wildlife and regulating hunting, 27 July 1984, designates Pythons as partially protected; they may only be taken under a special hunting permit and sold or exported if they are accompanied by documentary proof that they were acquired lawfully.

Chad No information.

Congo The Act concerning the conservation and exploitation of wild fauna, 21 April 1983, vests in the State ownership of all wild animals of economic value, and requires the issuing of licences for commercial capturing.

Equatorial Guinea The Hunting Regulations, 29 April 1953, establish the need to obtain hunting licences except for subsistence hunters. Reptiles are not protected.

Ethiopia Under the Wildlife Conservation (Amendment) Regulations, 12 February 1974, *Python sebae* are protected. They may only be hunted for scientific purposes and require a special permit, the value of which was set at Eth$12.50 for each python.

Gabon The Wildlife and Forests Act, 22 July 1982 requires the issuing of licences for the commercial capture of all wildlife. Traditional hunting for subsistence pruposes is permitted.

Gambia Under the Wildlife Conservation Act, 14 February 1977, all wildlife except game and vermin are protected.

Ghana The Wildlife Conservation Regulations, 4 March 1971, define *Python sebae* as totally protected.

Guinea No information.

Guinea-Bissau The Hunting Regulations, 12 May 1980, require the issuance of a licence for the capturing of live wild animals. Pythons are partially protected, and may not be taken by sport hunters.

Ivory Coast *Python sebae* is listed as a predatory animal in the Wildlife and Hunting Act, 4 August 1965, and may be hunted without licence anywhere except in protected areas. Arrêté No. 15, 26 December 1972, establishes licence fees for the capturing of live reptiles.

Kenya Protected under Legal Notice No. 152 (25 September 1981), export being prohibited (Broadley, 1983). Probably present in all Kenya's National Parks, except Mt. Kenya and Sibilot, too high and too dry, respectively (A.D. MacKay, *in litt.*, 26 March 1986).

Liberia The Wildlife Conservation Regulation (in draft, 1985) lists *Python sebae* as fully protected. Trade in and export of fully and partially protected species is prohibited except for educational or scientific purposes.

Malawi Hunting, possession, trade and export of game is controlled under the Game Act, 1953. No reptiles, other than crocodiles, are protected.

Mali All snakes are classified as game species under the Hunting Act, 11 November 1969. There is a general close season from 1 June to 31 October. A general hunting ban (Decree 325/PG-RM) throughout the country was imposed on 6 November 1978.

Mauritania Under the Hunting and Wildlife Protection Act, 15 January 1975, the capture, possession, sale and export of live wild animals requires a commercial capture permit. The sale of game meat is prohibited.

Mozambique

Namibia Protected by the Nature Conservation Ordinance (Namibia Department of Agriculture and Nature Conservation, *in litt.*, 1987).

Niger All hunting for utilitarian purposes has been prohibited in Niger since 1972 (Niger CITES MA, 1986).

Nigeria *Python sebae* is listed as fully protected in the Endangered Species (control of International Trade and Traffic) Decree, 20 April 1985. Their hunting, capture, trade and export is prohibited.

Rwanda Pythons are apparently not protected.

Senegal The Game and Wildlife Protection Regulations, 30 May 1967, lay down regulations governing the issuance of licences for hunting and commercial capturing of wildlife.

Sierra Leone Under the Wildlife Conservation Act, No. 27, 1972, pythons are classified as game animals with an unlimited quota, they may only be hunted by those in possession of a valid game licence.

Somalia Pythons are listed as game animals under the Law on Fauna (Hunting) and Forest, 25 January 1969. They may only be hunted or exported under licence. A ban on all hunting was instituted on 13 October 1977.

South Africa *P. sebae* occurs in 14 nature reserves in Natal and several in Zululand (South Africa CITES MA, 1987).

Sudan Pythons are listed in the Ordinance for the Preservation of Wild Animals, 1935 (Amended 1974), as species for which hunting is permitted. Licences are only required if firearms are used for hunting. The Hides and Skins (Export) Regulations, 1969, specify a grading system for the export of reptile skins.

Swaziland Apparently no reptiles are protected in Swaziland.

Tanzania *P. sebae* is classified as big game under the Wildlife Conservation Act, 30 June 1974. It may not be hunted or killed without a valid hunting licence. The capture of all live animals requires a valid capture permit, and the hunting of all animals requires a valid hunting permit.

Togo *P. sebae* is classified as a pest species under the Ordinance on Wildlife Protection and Hunting, 16 January 1968. An enabling decree, dated 4 June 1980, sets out licence fees for hunting and commercial capture, but there is no bag limit for the species.

Uganda Protected under the Game Act by Statutory instrument No. 20 of 31 October 1980 (Uganda Game Department, *in litt.*, 28 March 1987).

Zaire The commercial capture of unprotected animals requires a permit under the Hunting Act, 28 May 1982. Export can only be authorised if the exporter holds a certificate of lawful possession.

Zambia Pythons are listed as game animals in the National Parks and Wildlife Act, 3 December 1968, under which their hunting, possession, trade and export are controlled and fees are set for the export of trophies and live animals.

Zimbabwe *Python sebae* is declared a specially protected animal under the Parks and Wildlife Act, 1975. The collection of live reptiles and their eggs and their breeding in captivity are controlled under licence by the Parks and Wildlife (General) Regulations, 1981.

CAPTIVE BREEDING A recent inventory (Slavens, 1985) lists 37 specimens in 9 collections, with breeding in two groups; the total number in captivity will be much higher than this.

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Recommended list: 3
[No problem]

Ornithoptera caelestis (Rothschild, 1898)

Phylum	ARTHROPODA	Order	INSECTA
Class	LEPIDOPTERA	Family	PAPILIONIDAE

SUMMARY AND CONCLUSIONS *Ornithoptera caelestis*, generally considered as a subspecies of *O. priamus*, is endemic to the Louisiade Archipelago, Papua New Guinea. Although not common, there are believed to be strong populations of *O. caelestis* on three islands. It normally inhabits hills and mountains and its feeding habits are similar to those of *O. priamus*.

Ornithoptera caelestis is not threatened, although it has a rather limited distribution. International trading is virtually entirely in specimens reared ex-pupae and sold via the PNG Government Insect Farming and Trading Agency (IFTA). Present maximum sales in the order of 1000-1500 specimens per year are well within acceptable limits and pose no threat to *caelestis*. Indeed, the IFTA, through the PNG Government, could be encouraged to expand its operations in deadstock and, more particularly, in livestock (for butterfly houses). An increase in commercial contact between the IFTA and entrepreneurs in retailing centres might be advisable. CITES statistics show very low levels of trade in 1984 and 1985 but the numbers may have increased after the the lifting of the EEC ban on birdwing imports in 1987.

Conservation and utilization of birdwings are mutually reinforcing in PNG The IFTA and government agencies responsible for protected areas could work together to ensure that sufficient wild habitat remains to ensure a sustainable yield of *caelestis* and other species. The trading operations could go hand in hand with conservation efforts on behalf of threatened subspecies and species of birdwings. Threatened taxa are described in the Swallowtail Red Data Book (Collins and Morris, 1985).

Taxonomic note: Only D'Abrera (1975) of the recent authors considers *caelestis* to be a separate species. Haugum and Low (1978-79), after detailed examination of genital and other characteristics, found this to be 'a highly unwarranted separation for which we fail to find any support'. Hancock (1983) follows this decision, as do Collins and Morris (1985) in the Swallowtail Red Data Book. The CITES listings follow D'Abrera and hence this separate report becomes necessary, but on scientific grounds it is not justifiable.

DISTRIBUTION *Ornithoptera caelestis* is confined to the Louisiade Archipelago, off the south-eastern trip of the Papua New Guinea mainland (Haugum and Low, 1978-79).

POPULATION Described by Haugum and Low (1978-79) as localised and generally uncommon to fairly rare. However, Pyle and Hughes (1978) suggest that Misima, Nemoa and Hemenahei islands all support strong populations.

Interestingly, there is evidence from *caelestis* that overcollecting has the capacity to decrease populations or even cause local extinction. A number of

observers on the Louisiade island of Nemoa concurred that the population of *caelestis* was badly depressed for some years after the removal of several hundred specimens by expatriate collectors. The species was reintroduced to the site from another part of the island and subsequently flourished (Pyle and Hughes, 1978). In contrast, Pyle and Hughes (1978) present evidence that fairly heavy, but nevertheless carefully controlled, levels of cropping were sustained by *caelestis* on Misima Island. In this instance several dozen larvae and pupae were removed from a colony every season.

HABITAT AND ECOLOGY *O. caelestis* is a denizen of hills and mountains, with small populations at around 100 m, but rarely at sea-level. The feeding habits are similar to *O. priamus* with larvae on at least two species of *Aristolochia*.

THREATS TO SURVIVAL The level of threat to *caelestis* is difficult to assess. Haugum and Low (1978-79) indicate that the taxon is rather rare, while Fenner (*in litt.*, 1983) and Hutton (*in litt.*, 1983) concur and express fears for its future. Conversely, Pyle and Hughes (1978) describe how *caelestis* quickly developed a strong colony on *Aristolochia* vines growing prolifically on the young tree invaders of an abandoned garden. This level of adaptability is confirmed by the success of butterfly ranchers in the Louisiades, who attract *caelestis* to their gardens. *Aristolochia* vines are trained up trellises and the butterflies breed within the gardens. Some farmers, able to recognise the wild *Aristolochia*, take care to protect the plants when they create new gardens (Pyle and Hughes, 1978). On balance, *caelestis* seems adaptable and resilient, unlikely to be seriously threatened. However, the Louisiades are certainly in need of representative protected areas, to ensure the survival of strong, wild colonies in natural conditions.

INTERNATIONAL TRADE Table 1 shows the levels of imports of *caelestis*, 1980-85. The figures for 1980-1982 are of little value since Papua New Guinea did not submit a report to CITES in those years. The report for 1983 is probably an accurate representation of imports, while the data for 1984 are difficult to assess. Recent data from the IFTA indicated 1985 sales of 932 specimens, slightly up on previous years (Clark, P.B., *in litt.*, 1986) but the Papua New Guinea report for that year included the export of only one specimen. Commercial exports during 1986 reportedly totalled 851 specimens (Papua New Guinea CITES MA, 1987).

Theoretically, none of the EEC countries should have licensed the import of *caelestis* during the period 1983 to 1986 because of the birdwing inclusion on Annex C(1) of EEC Regulation 3626/82. In this regulation to implement CITES, all CITES Appendix II butterflies were effectively treated as Appendix I, thus prohibiting import. All birdwings except *Ornithoptera alexandrae* were removed to Annex C(2) of the regulation during 1987.

Papua New Guinea is the only country of origin *caelestis*, the taxon being endemic to the Louisiades Archipelago. Table 2 reflects this situation; figures for Germany and Japan being the result of incorrect reporting.

Table 1. Minimum net imports of *Ornithoptera caelestis* dead specimens reported to CITES, 1980-1984.

	1980	1981	1982	1983	1984	1985
Australia	-	-	-	22	5	-
Canada	-	-	-	-	2	-
France	-	-	-	229	-	-
Germany, F.R.	-	-	275	45	65	-
Ireland	-	-	-	4	-	-
Italy	-	-	-	4	-	-
Japan	-	-	-	64	-	-
Norway	-	-	-	2	-	-
Singapore	-	-	-	4	-	-
Switzerland	2	96	42	14	8	1
UK	-	-	-	29	-	-
USA	-	-	-	280	-	-
Unknown	-	-	-	48	-	-
Total	2	96	317	745	80	1

The *caelestis* material exported by the Insect Farming and Trading Agency, a government controlled body, is all farmed from pupae (Clark, P.B., *in litt.*, 1983, Fenner, 1976, National Research Council, 1983). In other words, the specimens are collected as pupae from *Aristolochia* vines tended specially for the purpose of attracting birdwings. The pupae are hatched in protected conditions and the adults killed and delivered to the IFTA for export. With such perfect specimens in good supply, there would be no demand for wild-caught material, which is invariably damaged. Although PNG did not report to CITES 1980-1982, information in CMC files indicates that sales of *caelestis* between 1978 and 1982 totalled 4400. All of these were via the IFTA and the majority, if not all, were ex-pupa. According to recent information, the IFTA had to slow down the ranching operation in the Louisiades because of a glut of stock. No doubt this was partly the result of the unwarranted EEC ban on imports. The international trade in all farmed or ranched birdwings from Papua New Guinea is greatly to be encouraged.

Table 2: Reported countries of origin (or exporting country if no original source reported) and quantities of transactions in dead specimens of *Ornithoptera caelestis*

	1980	1981	1982	1983	1984	1985
Countries having wild populations						
Papua New Guinea	-	80	317	745	78	1
Countries without wild populations						
Australia	-	10	-	-	-	-
Germany, F.R.	2	6	-	4	-	-
Japan	-	-	-	-	2	-

CONSERVATION MEASURES *O. caelestis* is not protected in Papua New Guinea, partly in recognition of its status, but largely because it is considered as a subspecies of *priamus*, the most abundant ornithopteran. Seven less common species are fully protected. The best way to conserve *caelestis*, paradoxically, is to maintain and extend its importance in international trading. Given sufficient natural habitat and encouragement from farmers who plant foodplants, the *caelestis* population on the Louisiades could sustain a far greater trade than is currently being achieved.

However, it is essential that the PNG government, in recognition of the growing potential of the insect trade, should put aside managment areas and protected areas in key sites for *caelestis* and other birdwing butterflies. Detailed recommendations for the implementation of such a plan have already been prepared by Parsons (1985).

CAPTIVE BREEDING It has not proved possible to breed *Ornithoptera* species in captivity. Furthermore, it is not particularly desirable to to do so since this would threaten the PNG ranching programme. As stated above, ranched specimens are reared ex-pupae from wild parents.

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NEW GUINEA, COMMON, COMMON GREEN OR PRIAM'S BIRDWING

Recommended list: 3
[No problem]

Ornithoptera priamus (L., 1758)

Phylum ARTHROPODA
Class LEPIDOPTERA
Order INSECTA
Family PAPILIONIDAE

SUMMARY AND CONCLUSIONS *Ornithoptera priamus*, the most widespread species in the genus, occurs from the Aru Islands in the Moluccas, down to the Torres Strait Islands and Cape York's Iron Range in Australia. For the purpose of this paper, *priamus* is deemed to include the subspecies *priamus, euphorion, hecuba, arruana, poseidon, gebeensis, boisduvali, admiralitatis, bornemanni*, and *miokensis*. Under CITES the taxa *richmondia, caelestis* and *urvillianus* are treated separately. *O. priamus* maintains high natural populations because its foodplant, *Aristolochia tagala*, is a vigorous vine that occurs wherever forest vegetation is regrowing after disturbance. Many other *Aristolochia* spp., and their associated birdwings, only survive in climax forest. *O. priamus* is reportedly not threatened, but the restricted subspecies *miokensis* (Duke of York Is.) is Endangered, *euphorion* (Queensland) is Indeterminate, *boisduvali* (Woodlark Is.) is Rare, the form *demophanes* (Trobriand Is.) of the subspecies *poseidon* is Rare, the subspecies *hecuba* (Kai Is.) and *arruana* (Aru Is.) are cause for concern and *gebeensis* is Insufficiently Known. The overwhelming source of threat to subspecies of concern is destruction of their natural habitat.

The trade in *O. priamus* (*sensu* D'Abrera, 1975) apparently involved about 1500 specimens a year between 1980 and 1983, a maximum of 2500 specimens in 1984 and about 5000 in 1985. The bulk of the trade involved the subspecies *poseidon* and *admiralitatis*, neither of which is threatened. Furthermore, the trade is almost entirely via the Insect Farming and Trading Agency (IFTA) in Papua New Guinea, a government-controlled organization which buys birdwings that are reared from pupae by butterfly ranchers. Trading does not represent a threat to *O. priamus*. Indeed, the IFTA, through the P.N.G. government, could be encouraged to expand its operations in deadstock and, more particularly, to begin trading in livestock (for butterfly houses) An expansion of the industry to include more species might also be recommended. An increase in contact between the IFTA and entrepreneurs in retailing centres might be advisable, but since CITES statistics show that a large proportion of the trade is with Europe, it is important that the EEC ban on birdwing imports (Regulation 3626/82) be lifted as quickly as possible (except for the Endangered *O. alexandrae*).

Conservation and utilisation of birdwings in Papua New Guinea are mutually reinforcing. The P.N.G. Government could set up more protected areas as a source of wild birdwing stock and of course to conserve birdwings and other forms of wildlife. Trading operations could go hand in hand with conservation efforts on behalf of threatened subspecies and species of birdwings. Threatened taxa are described in the Swallowtail Red Data Book (Collins and Morris, 1985).

Taxonomic note: conservation considerations are confused by nomenclatural inconsistencies. While there is general agreement as to the taxa or forms to which the ancestral *priamus* has given rise in its spread through the Papuan region, there remains much disagreement as to the precise status of these forms, i.e. whether they are still only subspecies, or whether their appearance, behaviour and distribution merit full specific status.

DISTRIBUTION The genus *Ornithoptera* (*sensu* Haugum and Low, 1978-79) is confined to New Guinea and its offshore islands (part of Indonesia and all of Papua New Guinea), the Solomon Islands, the Indonesian Maluku Islands (Moluccas) and the Australian states of Queensland and New South Wales.

Ornithoptera priamus is the most widespread species in the genus, extending throughout this range, from Ceram and Ambon through New Guinea and the islands of the Papuan group to the Solomon Islands in the east and N.E. Australia in the south (Haugum and Low, 1978-79). The taxonomic situation and distribution of each taxon is summarized in Table 1 below.

POPULATION No precise information is available on densities and total populations of any subspecies of *O. priamus*. Indeed, such data are rare for any butterfly. However, there is general agreement that *O. priamus* is the most widespread and successful of the *Ornithoptera*. It is classified as not threatened in the IUCN Swallowtail Red Data Book (Collins and Morris, 1985). The breadth of distribution of the numerous subspecies is so variable that each needs to be considered separately.

Australia

O. p. euphorion, commonly known as the Cairns Birdwing, appears to have some populations of a high density. It is recorded as common at various localities around Cairns itself, but for other historically important locations there are no recent statements (Haugum and Low, 1978-79). It is generally considered that *euphorion* is less numerous than it was previously, although there are few substantiated records. Haugum and Low, however, state that 'there is no doubt ... that at certain localities where the imagines have been collected in quantity for commercial purposes, the numbers have been drastically reduced in recent years.' Other populations have also suffered. D'Abrera (1975) believed that a reduction in the number of adults in the Etty Bay area south of Cairns is due to over-collecting, although this statement requires substantiation.

Indonesia

O. p. priamus from Ceram and Ambon in the Moluccas is supposedly common in nature, but there are few published observations and no recent ones (Haugum and Low, 1978-79). For the present it is regarded as not threatened.

O. p. gebeensis, only recently described from Gebe island, between Waigeo and Halmahera (Parrott, 1985), is lacking in all but taxonomic information. It is classified as Insufficiently Known until such time as its conservation status on this small, 500 sq. km., island may be properly assessed.

O. p. hecuba from the Kai Islands suffers from a lack of recent data and little is known of its status, but it appears not to be rare in the coastal areas of the main islands. It is known to have been abundant early this century, when various aberrations were described (Haugum and Low, 1978-79). This subspecies should perhaps be classified as Rare in view of its restricted distribution. Data on the extent of suitable habitat are needed.

O. p. poseidon see notes under Papua New Guinea.

Table 1: The systematics, distribution and IUCN category of the *Ornithoptera priamus* subspecies listed by Haugum and Low (1978-79). D'Abrera (1975), the authority used by CITES, recognised three of these as separate species while Hancock (1983) recognised two as separate species. Collins and Morris (1985), in the Swallowtail Red Data Book, followed Hancock's classification.

		Authors			Distribution	IUCN Threat Category
		Haugum & Low (1978)	D'Abrera (1975)	Hancock (1983)		
1.	*richmondia*	*	+	+	Australia (Queensland, New South Wales)	I
2.	*euphorion*	*	*	+	Australia (N. Queensland)	I
3.	*priamus*	*	*	*	Indonesia (Ceram, Ambon)	nt
4.	*gebeensis*	0	0	0	Indonesia (Gebe Island)	K
5.	*hecuba*	*	*	*	Indonesia (Kai, Walim, Laut)	R?
6.	*arruana*	*	*	*	Indonesia (Aru, off Halmahera)	R?
7.	*poseidon*	*	*	*	Papua New Guinea and Irian Jaya (Waigeo mainland and adjacent islands), Australia (Cape York)	nt
8.	*boisduvali*	*	*	*	Papua New Guinea (Woodlark Is.)	R
9.	*admiralitatis*	*	*	*	Papua New Guinea (Admiralty Is.)	nt
10.	*bornemanni*	*	*	*	Papua New Guinea (New Britain)	nt
11.	*miokensis*	*	*	*	Papua New Guinea (Duke of York Is.)	E
12.	*caelestis*	*	+	*	Papua New Guinea (Louisiades)	nt
13.	*urvillianus*	*	+	*	Papua New Guinea (New Hanover, New Ireland), Solomon Is.	nt

* = recognized by author(s) as a subspecies of *O. priamus*
\+ = recognized by author as a full species
0 = unknown to these authors; described by Parrott (1985)

Various forms of *O. p. poseidon* are occasionally cited or sold as separate subspecies. These include:

teucrus from Biak and Schouten
archideus from Waigeo
pronomus or *macalpinei* from Cape York (Iron Range)
demophanes from Ferguson, Trobriands
cronius from SW coast of New Guinea

O. p. arruana, from the Aru Islands, is unknown, but it is probably not too uncommon. Most populations are apparently near the coast (Haugum and Low, 1978–79). The subspecies should perhaps be classified as Rare in view of its limited distribution; data on habitat are needed to assess the question of threat.

Papua New Guinea Parsons (1985) reports that the species *O. priamus* is locally common to abundant, generally common and very widespread. This is encouraging since P.N.G. is currently the main exporting country of origin.

O. p. poseidon probably ranges over the whole of mainland New Guinea and the offshore islands. It certainly occurs from Waigeo in the west to the Trobriands and D'Entrecasteaux in the east, and south into the extreme northern Cape York Peninsula of Australia and in the Iron Range (Haugum and Low, 1978–79). Locally abundant, it is usually found at low or medium altitudes up to 1500 m, particularly in coastal areas. Generally little is known of its status, but its range in P.N.G. is now known to span the whole mainland (Parsons, 1985) and it is certainly the most abundant ornithopteran. There is a marked lack of information on the populations of *poseidon* in Irian Jaya, including all southern districts, most western, and the Indonesian islands (Haugum and Low, 1978–79), although Parsons (1985) implies that it is at least as abundant there as it is in the Papuan part of New Guinea. Morris (*in litt.*, 1986) recently travelled in Irian Jaya and found *poseidon* to be very widespread. The subspecies as a whole is therefore listed as not threatened. However, the form *demophanes* (sometimes listed as a separate subspecies) is restricted to the Trobriand Islands, which are generally heavily populated and deforested. With severe destruction of its habitat and intermittent heavy collecting pressure, the status of *demophanes* is a matter for concern (Fenner, *in litt.*, 1983; Hutton, *in litt.*, 1983). In 1978 it was reported to be numerous in a small area of Kiriwina, but elsewhere in the Trobriands to have very little suitable habitat remaining (Pyle and Hughes, 1978).

O. p. boisduvali is endemic to the small island of Woodlark, east of the P.N.G. mainland and isolated between the South Solomon Sea and the Louisiade Archipelago. It is very poorly represented in collections, and its status is unknown, probably fairly rare (Haugum and Low, 1978–79). The P.N.G. Insect Farming and Trading Agency has organized the collecting of some material since the 1970s. It is classified as Rare on account of its very restricted distribution and possible threats to its habitat.

O. p. admiralitatis, from Manus, the main island of the Admiralty group, is believed to be widespread within the confines of its 80 km-long island, but rather localised. Ebner (1971) found it to be common, flying throughout the year. It is not regarded as threatened.

O. p. bornemanni from New Britain and the adjacent islands is reportedly generally widespread and locally abundant, especially in suitable localities along the seashores (Haugum and Low 1978–79). Females are said to be not infrequent in certain coastal coconut plantations. Its present status is unknown, but it is unlikely to be in serious decline and is classified as not threatened.

O. p. miokensis is known only from the small group called the Duke of York Islands. It was once referred to as not rare but is now known to have been declining in recent years as a result of the high human populations and

intense agricultural activity in its main habitat areas. Pyle and Hughes (1978) visited the Duke of Yorks in the course of a consultancy on P.N.G. butterflies. They concluded that 'the Duke of Yorks ... have been nearly obliterated as diverse butterfly habitat.' They considered *miokensis* to be threatened with extinction, not from collecting but from sheer displacement. Believed to be extirpated from its type locality of Mioko and with no suitable habitat on Milmila, it may be confined to a 50 ha site on one end of Ulu Island. It is therefore classified as Endangered. There is a possibility that *Miokensis* is a hybrid between *urvillanus* and *bornemanni*, but so far no substantiating evidence has been published.

HABITAT AND ECOLOGY *Ornithoptera priamus*, probably the most successful species in the genus, has adapted to a range of diverse habitats and is oligophagous, feeding on a number of *Aristolochia* species in the larval stage but usually on *Aristolochia tagala*. *Aristolochia*, commonly called the Dutchman's Pipe Vine, has a distinctive flower with a single, prolonged lip-like petal and typically a tubular throat and swollen, rounded, basal chamber that encloses the stamens etc. The flower can be 90 mm in length and the leaves are also large, being heartshaped and up to 200 mm or so long. Vines reach up to 10 m but are more commonly 3-5 m high.

O. priamus occurs exclusively in marginal and open secondary forest, where *A. tagala*, unlike other species, grows well. *A. tagala* grows fast and can host large numbers of caterpillars (Clark, P.B., *in litt.*, 1986). Habitat includes forest margins, large regrowth areas within mature secondary or climax forest and strand vegetation above high tides. *O. priamus* flies and breeds up to 1000 m altitude and adults occur up to 1500 m.

Adults take just over two months to develop from the egg, and may survive for over 3 months. Females could lay an estimated 630 eggs, at a rate of seven eggs per day for three months, but lifespans will vary.

Parasitism by encyrtid wasps and predation by *Oecophylla* ants can be high at times, but losses of larvae and pupae are relatively low as a result of sequestration of unpalatable by-products from the foodplant (Clark, P.B., *in litt.*, 1986). As would be expected, a variety of opportunistic predators (including man) have been observed, but attacks by chalcid wasps and other parasitoids are rare (Parsons, 1985).

THREATS TO SURVIVAL The species *Ornithoptera priamus* is not under threat, being widespread and abundant in many localities. However, some of the subspecies give cause for concern (see Table 1 and comments under Populations).

Collecting and trade would not normally represent a threat to healthy and widespread butterfly populations, and this is certainly the case for subspecies *priamus, poseidon, admiralitatis* and *bornemanni*. Some other subspecies, notably *miokensis* and possibly *boisduvali*, have suffered setbacks through habitat destruction, often within the already narrow confines of a restricted vegetation type or small island. In these cases trading needs to be particularly carefully controlled, but it is at present extremely low and represents no threat. The subspecies *gebeensis*, only described in 1985, could be in demand as a novelty. The situation of this taxon needs to be investigated and monitored.

INTERNATIONAL TRADE Table 2 shows the minimum net imports of *Ornithoptera priamus* reported to CITES, 1980-85. Table 3 is a breakdown of these imports between the various subspecies. The bulk of the trade was in subspecies *poseidon* and *admiralitatis*, neither of which are under threat. Trade in

threatened subspecies is minimal. The five major importers were Switzerland, Federal Republic of Germany, Spain, France and the U.S.A. Theoretically, none of the EEC countries should have licensed the import of *priamus* or any other birdwing during 1983, 1984 or 1985 because of the inclusion of birdwings in Annex C1 of EEC Regulation 3626/82. In this regulation to implement CITES, all CITES Appendix II butterflies were effectively treated as Appendix I, thus prohibiting import. All birdwings except *Ornithoptera alexandrae* were removed to Annex C(2) of the regulation during 1987.

Table 2: Minimum net imports of Priam's birdwing (*Ornithoptera priamus*) butterfly bodies (all subspecies) reported to CITES, 1980-1985.

	1980	1981	1982	1983	1984	1985
Australia	–	–	4	48	36	5
Canada	–	–	–	1	16	1
Colombia	–	–	–	–	–	25
France	–	–	–	243	–	–
Germany, F.R.	–	–	371	75	–	–
Ireland	–	–	–	20	–	–
Italy	–	–	–	6	–	–
Japan	–	–	–	34	29	106
Norway	–	–	–	2	–	–
Singapore	–	–	–	9	–	–
Spain	–	250	–	10	–	–
Sri Lanka	–	–	–	–	1	–
Switzerland	59	94	38	21	23	6
UK	–	–	–	82	11	3
USA	–	–	–	451	8	28
Vanuatu	–	–	–	2	–	–
Unknown	–	–	–	332	–	–
Total	59	344	413	1336	124	174

Table 3: Breakdown of imports of *Ornithoptera priamus* into subspecies:

Subspecies	1980	1981	1982	1983	1984	1985
euphorion	–	4	–	–	2	34
hecuba	–	–	–	–	2	–
arruana	–	–	–	–	2	–
poseidon	1	–	228	1080	111	114
admiralitatis	–	8	186	256	5	–
bornemanni	–	–	1(?)	–	–	–
miokensis	–	–	1(?)	–	–	–
Unknown	58	332	–	–	2	26
Total	59	344	413	1336	124	174

Ornithoptera priamus

Table 4 gives the reported countries of origin, 1980-85. Reported export of *euphorion* from Australia was quite low, probably because the taxon is protected in Queensland and only available for export when accompanied by an expensive licence.

No exports are reported from Indonesia, where *O. priamus* is protected (see below). However, 'protection' implies that collecting is permitted under licence. Only 'strictly protected' species may not be taken under any circumstances. Indonesia must have been the origin of at least the two specimens each of *hecuba* and *arruana*.

Papua New Guinea is the only significant exporter of *Ornithoptera priamus* during the 1980s. Unfortunately, P.N.G. did not produce proper reports to CITES in 1980, 1981 or 1982, so that CITES statistics are unreliable for those years. However, from information on file at CMC, between 1400 and 1600 specimens were believed to have been exported by the Insect Farming and Trading Agency (IFTA) during that year. Data for the year 1985 indicate that sales of *priamus* through IFTA amounted to 2422 specimens (Clark, P.B., *in litt.*, 1986). This figure does not include a further 2383 specimens of *urvillianus* and 932 specimens of *caelestis* and it is far higher than the number reported to have been exported in the P.N.G. report to CITES for 1985. Commercial exports for 1986 were reported to have included: 6201 *poseidon*; 695 *admiralitatus*; and 57 *bornemanni* (P.N.G. CITES MA, 1987). Fenner (*in litt.*, 1976) considered the world market could absorb 5000 pairs per year of *poseidon* alone.

Table 4: Reported countries of origin (or exporting country if no original source reported) and quantities of transactions in dead specimens of *Ornithoptera priamus*.

	1980	1981	1982	1983	1984	1985
Countries having wild populations:						
Australia	-	46	-	2	-	79
P.N.G. *	- (1500)	250 (1400)	413 (1600)	1337	110	94
Countries without wild populations:						
Germany, F.R.	59	48	10	7	10	-
France	-	-	-	-	4	-
Philippines	-	-	-	-	-	1

* Papua New Guinea did not report its exports to CITES in 1980-1982. Figures in brackets are estimated from information held in CMC files.

The implication is that these figures are well within the limits that wild populations can sustain and that trade in *priamus* subspecies during 1980-1985 posed no threat whatsoever to wild populations. Indeed, the controlled marketing of birdwings by the IFTA is likely to encourage conservation of natural habitat as a source of butterflies. This is essential to sustain the birdwing butterfly ranching programme run by the IFTA, as well as its other trading activities. About 30 per cent of all butterflies

reaching the IFTA are ranched, the rest are collected as adults in the wild. However, over 50 per cent of revenue is from the better quality ranched specimens (National Research Council, 1983). Collecting of wild adult birdwings is currently discouraged by IFTA because the specimens are invariably damaged and are thus of little value (Clark, P.B., *in litt.*, 1986).

In recent years there has been a growing demand for birdwing pupae that can be reared and released in 'butterfly houses' in temperate countries. Essentially these places consist of glass-houses containing tropical plants, in which butterflies fly freely whilst visitors walk around and watch, photograph, or even touch them. The benefits in educational terms are very high, while reductions in wild populations are minimal. For these reasons the trade in livestock is to be encouraged.

CONSERVATION MEASURES

Australia The species *Ornithoptera priamus* is protected under the Queensland Fauna Conservation Act of 1974. The intention of the law was undoubtedly to protect all three Australian taxa, *poseidon, euphorion* and *richmondia*, notwithstanding changes of taxonomic opinion since the law was passed. Specimens may be collected only under licence. Although over-collecting has undoubtedly been a problem in some areas, particularly for *euphorion* and *richmondia*, habitat destruction probably constitutes the gravest danger in the long term. Parsons (1985) is of the opinion that of all the *priamus* subspecies only the Australian *euphorion* and *richmondia* (which Parsons includes as a subspecies of *priamus*) warrant conservation concern. There is, however, sufficient evidence to warrant concern for *miokensis* too (see above).

Indonesia Indonesia has included *O. priamus* in its list of protected butterflies, published in a decree of 1980. As stated above, this means that butterflies may only be taken under licence. In effect this restricts world trade in the subspecies *gebeensis, hecuba* and *arruana*, endemic to Gebe Island, the Kai and Aru Islands respectively. It also restricts trade in *poseidon* from Waigeo, Irian Jaya and the offshore islands, leaving the market almost entirely to Papua New Guinea. The effect of this decree could, in the long term, be counter-productive. Whilst hindering the development of farming and ranching of this and other birdwing species, it does nothing to protect habitat. Indonesia is currently developing a system of protected areas for Irian Jaya; a marine reserve is proposed for the Aru Islands, and the proposed Kai Besar Reserve will cover 37 000 ha. It remains to be seen how effectively these protected areas will benefit birdwing butterflies.

Papua New Guinea P.N.G. protected seven species of *Ornithoptera* in 1968, but these did not include *priamus* or any of its subspecies. The government realised that *O. priamus* and *Troides oblongomaculatus* were common and therefore did not warrant protection (Parsons, 1985). These two species are the cornerstones of the P.N.G. butterfly ranching programme. More recently, it has been proposed that *O. victoriae*, and possibly *O. goliath*, should be removed from the protected list and brought into trade. So far, however, no changes have been made.

In a recent confidential report to the P.N.G. Government, M.J. Parsons has proposed a complex of protected sites throughout P.N.G., with a view to safeguarding the rarer species such as *O. alexandrae, O. chimaera, O. paradisea* and others. No response to the report has been made available to CMC.

CAPTIVE BREEDING It has not proved possible to breed *Ornithoptera* species in captivity. Indeed, it is not particularly desirable to to do so since this would threaten the existing P.N.G. ranching programme as well as incipient programmes in Irian Jaya and the Solomon Islands. As stated above, ranched specimens are reared ex-pupae from wild parents.

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MANUS GREEN TREE SNAIL

Recommended list: 2
[Possible problem]

Papustyla pulcherrima Rensch, 1931

Phylum	MOLLUSCA	Order	STYLOMMATOPHORA
Class	GASTROPODA	Family	CAMAENIDAE

SUMMARY AND CONCLUSIONS This well known brilliant green tree snail is endemic to the rain forest of Manus Island, northern Papua New Guinea. Its restricted range makes it particularly vulnerable to large-scale deforestation which is not a problem at present but could easily become one as there is no protection of the Manus Island forests. Papua New Guinea is considering passing protective legislation for this species. Listed as Rare in the IUCN Invertebrate Red Data Book and as Endangered under the U.S. Endangered Species Act, it is much sought after by shell collectors. Although there is little information available, this species, like other Pacific tree snails, is probably vulnerable to over-collection.

It is known that shells are exported to Japan, Australia and probably Europe, both as commercial consignments and in personal effects but, despite CITES listing, the trade has been very poorly monitored. A shipment of 300 shells was exported to the UK in 1981 via Australia and 1072 were reportedly exported to Thailand in 1985; there have been no other records of commercial shipments.

A study of the distribution, ecology and population of this species is urgently required to provide the data for constructive recommendations for management of the trade. This must be one of the easiest CITES-listed species for a customs officer to identify because of the unique colouration of the shell and accurate reporting of the trade should therefore be possible. Monitoring of the trade should be improved and the number of specimens leaving the country in personal as well as commercial consignments should be checked.

DISTRIBUTION Manus Island, Admiralty Archipelago, northern Papua New Guinea (Clench and Turner, 1962). Few professional malacologists have collected specimens and those in museums have been obtained mainly by traders, explorers or incidentally by collectors of other animal material. Precise locality data are therefore poor (Clench and Turner, 1962). The snail is known to occur several kilometres inland from Lorengau, the provincial capital, and can be collected along the main highway (Harrison Gagne, 1981; Wells, 1982) but may well occur in other less accessible areas of the forest. Frequently referred to under the old name of *Papuina pulcherrima*.

POPULATION Unknown.

HABITAT AND ECOLOGY No scientific studies have been carried out on this species, and the only information available is from anecdotal accounts. The snail is restricted to rain forest. The main host trees are *Dillenia* (Dilleniaceae) and *Astronia* (Melastomataceae), although it may also be found on other species and on large climbing aroids. Only a few individuals are found in each tree. The snails are inactive during the day and are found attached to the undersides of leaves, five or more metres above the ground (Harrison Gagne, 1981).

Papustyla pulcherrima

THREATS TO SURVIVAL The Manus Green Tree Snail appears to be relatively host specific to trees with timber potential, and logging is almost certainly the main threat. In 1977 the snail was said to have retreated into the wilder central forests of the island and populations were thought to have been much reduced or eliminated by collecting and agriculture within a several mile radius of Lorengau (Pyle, *in litt.*, 1980). However, specimens were found quite easily near Lorengau in 1981 and there was little evidence of heavy collection. New roads were being opened up through the forest which could pose a potential threat through loss of habitat and increased accessibility for collectors. It has been reported that branches are cut down to obtain single snails (Harrison Gagne, 1981) but this seems unlikely as collectors generally climb the trees (Wells, 1982; Pitman, 1977). Nevertheless, collecting could pose a threat, given the restricted range of this species, and the possibility that the population is small and slow to replace itself.

INTERNATIONAL TRADE The shells are still used by Manus islanders for decorative purposes (Harrison Gagne, 1981). Its intense green coloration makes *Papustyla pulcherrima* unique among land molluscs and as a result it is highly prized by shell collectors. The shell is often used in jewellery. In the 1970s collection was said to be heavy with large numbers being bought by tourists and exported by dealers (Pitman, 1977). However, the commercial export trade seems to have declined. Between January and June 1981, 154 shells were exported by the New Guinea Shell Agency. The decline was partly due to problems in the running of the shell agency; collectors were not receiving their payment and the agency staff showed little interest in promoting the business. 834 specimens had been collected and deposited at the Lorengau Department of Business Development that year but were not being forwarded to the agency until payment for past consignments was received (Wells, 1982). The current status of the agency is not known. The following figures were reported to CITES between 1980 and 1984:

Table 1 Minimum net imports of *Papustyla pulcherrima* shells reported by CITES Parties. All of this trade reportedly originated in PNG.

	1980	1981	1982	1983	1984*	1985
Australia	-	-	-	1	-	-
Thailand	-	-	-	-	-	1072
UK	-	300	-	1	-	-
USA	-	1	-	8	-	-

PNG did not supply annual reports to CITES for the years 1980-1982.

* 17 640 carvings of this species were reportedly imported by USA from Taiwan in 1984 - this is almost certainly an error in the CITES report and this figure probably refers to black coral, Antipatharia; it is most unlikely that such large numbers of shells are being exported from Papua New Guinea and the import would presumably have been illegal.

Despite the decline in the trade, the CITES reports clearly underestimate the total international trade. For example, considerable numbers of shells go to Japan (Wells, 1982; Kwapena *in litt.*, 1985) and large numbers were on sale in Australia in 1979 (Bruggen *in litt.*, 1981).

CONSERVATION MEASURES It is listed as endangered under the U.S. Endangered Species Act and imports into the USA are prohibited.

Logging poses the greatest threat to this species at present and reserves should be created in appropriate sites to provide protection for snail populations should large-scale logging commence. Papua New Guinea is considering passing protective legislation for this species (Kwapena, *in litt.*, 1985). If the current trade is no larger than it appears, it is unlikely to be having any major impact on populations, but it is possible that there is a significant amount of unrecorded trade. Monitoring of the trade should be improved, and the number of specimens leaving the country in personal as opposed to commercial consignments should be checked. This must be one of the easiest CITES-listed species for a customs officer to identify because of the unique coloration of the shell and accurate reporting of the trade should therefore be possible. A thorough study of the distribution, ecology and population of this species is urgently required to provide the data for constructive recommendations for management of the trade. In 1981, local people and expatriates were largely ignorant of the CITES listing of this species and the need for export permits (Wells, 1982), and there was a clear requirement for a public awareness campaign. The Manus Green Snail is only one of a number of land and tree snails being collected for export in Papua New Guinea (Wells, 1982). Since most of these are barely known to science the opportunity should be taken of obtaining live specimens for anatomical studies, and surveys and ecological studies should be carried out to determine more precisely their distribution patterns and population biology.

CAPTIVE BREEDING No attempts at captive breeding known but at one time Manus villagers attempted to 'farm' snails by collecting them from the wild and raising them in large cages; this was unsuccessful.

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BLACK (WHIP) CORAL

Recommended list: 2
[Possible problem]

Cirrhipathes anguina Dana

Phylum	CNIDARIA	Order	ANTIPATHARIA
Class	ANTHOZOA	Family	ANTIPATHIDAE

SUMMARY AND CONCLUSIONS *Cirrhipathes anguina* is a whip coral with a wide Indo-Pacific distribution and is found attached to rocks and coral reefs, often at shallow depths unlike many black corals. Data on the ecology, abundance and distribution of all black and whip corals, found in tropical and subtropical waters in all major oceans, are scanty. The order Antipatharia is listed in the IUCN Invertebrate Red Data Book as Commercially Threatened and on Appendix II of CITES. Black corals are protected in a number of countries in the Caribbean but as yet few Indo-Pacific species receive protection.

C. anguina accounts for most international trade as it is used exclusively for the making of bracelets which are probably the most popular and cheapest items in the precious coral market. It is exported to the U.S.A. in large quantities, mainly from Taiwan and the Philippines, but there is no information on collecting localities. There are no specific reports of depletion of *C. anguina*, mainly because no studies have been carried out, but there have been many general reports of over-collection of local populations of black corals in shallow waters.

As a result of CITES reporting, the importance of *C. anguina* has been revealed and efforts should now be made to study the ecology, distribution and exploitation of this species in order to make recommendations for its sustainable use.

Taxonomic note: Classification and identification of the 150 known species of black coral is complicated. The genus Antipatharia includes the true black corals, which form branched plant-like colonies, and the whip or wire corals such as *C. anguina* which form unbranched stick-like structures which are sometimes coiled. *C. anguina* is generally unbranched and may reach a length of one metre or more. Colonies are strengthened by a brown or black skeleton of horny material; the polyps which are situated in the living tissue around this skeleton are short and cylindrical with six tentacles which cannot be retracted. The lower end of the colony is attached to a firm substrate by a flattened base or may simply extend into the sediment (George and George, 1979; Grigg, 1976; Warner, 1981).

DISTRIBUTION Black coral is found in tropical and subtropical waters in all major oceans. The distributions of individual species are poorly known. *C. anguina* occurs from 30-500 m throughout the Indo-West Pacific (George and George, 1979).

POPULATION Unknown.

HABITAT AND ECOLOGY Black corals are usually found in deep water, between 30-110 m although some have been recorded from depths of 2000-3000 fathoms (4000-6000 m). A number of species however are found in shallower water. For example, off Curaçao, black corals are found mainly between 15 and 50 m (Noome and Kristensen, 1975). *C. anguina* also occurs at shallow depths (10-20 m) which accounts its widespread use in trade. It is found attached to hard

substrates such as rocks or corals and is frequently present on coral reefs. Work on branching black corals has shown that colonies are frequently associated with terraces and undercut notches. Adult colonies can withstand light intensities of up to 60 per cent of the surface incident light, but it appears that larvae cannot settle and survive under a light intensity greater than 25 per cent of the surface light. This would account for the greatest densities being found below 35 m, colonies being found at shallower depths only in turbid water or in shaded areas (Grigg, 1965; Grigg, 1976). The normal method of feeding is probably trapping of animal plankton by the nematocysts (Warner, 1981). Polyps are either male or female but colonies may be hermaphroditic (George and George, 1979). Reproductive maturity in the black coral *Antipathes dichotoma* is probably reached between 10 and 12.5 years and the reproductive cycle may be annual. Asexual reproduction occurs naturally by fragmentation of branch ends. Colonies may have a life span of 70 years (Grigg, 1976). Further research is required to determine to what extent the whip corals such as *C. anguina* have a similar life history.

THREATS TO SURVIVAL Black corals have been locally depleted in many areas in shallow water, but deeper populations are unlikely to be exploited to extinction due to their inaccessibility. Caribbean species have been particularly heavily exploited (Castorena and Metaca, 1979; Goldberg, 1981; Noome and Kristensen, 1975; De la Torre, 1978; Wells *et al.*, 1983). Extrapolating from the problems that have arisen in the Caribbean, it is highly likely that local populations of *C. anguina* in south-east Asia are being depleted by the trade. Black Corals may also be affected by habitat disturbance, particularly species such as *C. anguina* which are found on coral reefs.

INTERNATIONAL TRADE In the Middle and Far East black coral has long been accredited with medicinal and magical properties (Hickson, 1924) but such traditional use probably has little impact on populations. More recently, black coral has become a very popular material for jewellery which is either made for export or sold to tourists. Identification of the raw material to species level is difficult and is almost impossible with worked or manufactured products; black coral, both raw and carved, is probably regularly shipped under the wrong name. Furthermore, synthetic 'Black Coral' is often sold to unsuspecting tourists (Grigg and Eade, 1981). No statistics have previously been available for the black coral trade but figures reported to CITES now give some indication of its level. However, since 1982, when Antipatharia were listed on CITES, only the USA has regularly reported *C. anguina* shipments to CITES (Table 1).

Table 1. Origin countries of imports of *C. anguina* reported to CITES 1981-1985 by the USA. Numbers of 'carvings' - C, and 'raw corals' - R.

		1980	1981	1982	1983	1984	1985
Philippines	C	-	-	1073	162	5830	2657
Taiwan	C	-	-	157708	190903	158150	167313
							+ 52 kg
	R	-	-	1000	-	-	2263
Total	C	-	-	158781	191065	163980	169970
							+ 52 kg
	R	-	-	-	-	-	2263

In addition, consignments of black coral are reported to CITES under the heading 'Antipatharia' and some of these, from countries in the Indo-Pacific, may include *C. anguina* (Table 2). The USA is the only country which has reported significant quantities of trade in Antipatharia, the only exceptions being Japan, which reported imports of 1000 kg of raw corals from Taiwan in 1982, and Switzerland which imported 1 carving from Italy in 1985 which reportedly originated in Taiwan.

Table 2. Indo-Pacific countries of export or origin of Antipatharia carvings and raw corals reported to CITES, 1981-1985 by the USA.
C = carvings, R = raw corals.

		1980	1981	1982	1983	1984	1985
Fiji	C	-	-	3	-	-	12
Hong Kong	C	-	-	7346	1350	-	-
	R	-	-	492	-	-	-
Indonesia	R	-	-	-	24	-	-
Kenya	C	-	-	-	127	-	-
Korea	C	-	-	2500	-	13	-
Philippines	C	-	6869	4726	198	619	7437
	R	-	117	190	-	-	-
Taiwan	C	-	5242	169586	134394	24156	147576
	R	-	-	9657	3042	-	-
Tonga	C	-	-	-	-	576	93
Total	C	-	12111	184161	136069	25364	155118
	R	-	117	10339	3066	-	-

According to CITES statistics, the USA is a major importer of carved *C. anguina* from Taiwan and the Philippines. Unfortunately there is no information on the operation of the trade in the countries of origin. Japanese and Taiwanese fishing boats were reported to be taking black coral from Papau New Guinean waters in the early 1980s and it is known that *C. anguina* occurs here. A local fishery provides corals to the main jewellery firm in the country and coral products are exported mainly to Australia (Wells, 1982). Black Coral is also harvested commercially in Hawaii (Grigg, 1976) and small quantities are collected on Guam (Hedlund, 1977) but these do not include *C. anguina*. In 1982 the Black Coral harvest in Hawaii was about 50 per cent lower than in previous years on account of a depressed market and past stockpiling. Current levels are significantly below the estimates of a maximum sustainable yield, and in this area at least there is no danger of over-collection (Grigg, *in litt.* 5.8.82).

CONSERVATION MEASURES No countries specifically protect *C. anguina*. The entire order Antipatharia is listed on Appendix II of CITES and is included in the IUCN Invertebrate Red Data Book under the category Commercially Threatened (Taxa not currently threatened with extinction but most or all of whose populations are threatened as a sustainable commercial resource, or will become so unless their exploitation in regulated). The order Antipatharia is listed under the Netherlands legislation for protected non-native species (Anon, 1980) and black coral is protected in New Zealand (Richardson, 1981).

In Hawaii permits are issued for limited commercial harvesting and there is a minimum size limit of 1.2 m in height and/or 2.5 cm in stem diameter (Grigg, 1976). Caribbean species of black coral receive varying degrees of protection in Antigua, Barbados, Belize, the British Virgin Islands, Florida (USA), Jamaica, Mexico, Netherlands Antilles, Trinidad and Tobago, U.S. Virgin Islands (Wells *et al.*, 1983).

A number of management studies have been or are being carried out on black corals but these usually concern the branching *Antipathes* species. For example, in Hawaii, an optimum annual sustainable yield of 5000 kg has been estimated for the stock of 84 000 colonies in the Auau Channel (Grigg, 1976). Management studies have been carried out in Papua New Guinea (Tarr, 1978), Guam (Hedlund, 1977), the Galapagos (Robinson, 1982) and Mexico (Castorena, 1979) and projects are underway in Tonga (Anon., 1985) and New Zealand (Grange, 1985).

There is an urgent need for study and monitoring of the black coral trade. As a result of CITES reporting, the importance of *C. anguina* has been revealed and efforts should now be made to study the ecology, distribution and exploitation of this species in order to make recommendations for its sustainable use. A number of studies have been carried out on branching black corals which provide models for the investigation and management of the *Cirrhipathes* fisheries. Since *C. anguina* appears to be of particular importance in the trade and may prove to be as vulnerable to intensive collection as the branching black corals, the need for appropriate information is considered a high priority. The potential for planting cuttings of *C. anguina* has been investigated in Papua New Guinea but no results have been published (Wells, 1982). This is an area of research which would be of particular interest to the trade.

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